

ED 338 510

SE 052 649

TITLE International Agri-Awareness.
 INSTITUTION Indiana State Dept. of Education, Indianapolis.
 PUB DATE 91
 NOTE 84p.
 PUB TYPE Guides - Classroom Use - Teaching Guides (For Teacher) (052)

EDRS PRICE MF01/PC04 Plus Postage.
 DESCRIPTORS *Agricultural Education; Consumer Economics; Elementary Secondary Education; Environmental Education; Exports; Instructional Materials; *Interdisciplinary Approach; International Relations; *International Trade; Language Arts; Mathematical Concepts; Mathematics Skills; *Resource Materials; Scientific Concepts; Scientific Methodology; Social Studies

IDENTIFIERS Corn; *Environmental Awareness; Environmental Concepts; Hogs; Indiana; *International Agricultural Education; Soybeans

ABSTRACT

Technological progress in communication and transportation within the past 30 years has made many areas of the world accessible, as well as interdependent. Failure to understand the concept of interdependency greatly diminishes the potential of all nations and each citizen to appreciate this world community. This agricultural awareness program addresses the development of students' attitudes and competence related to international relationships, the diversity of cultural values, the similarities of the human species, and an understanding of current world conditions. The introduction contains: information about the demographics, the climate, and the natural resources of the State of Indiana; the rationale and the purpose of this international agricultural awareness program unit; the correlations between this program's goals and the Indiana State proficiency objectives; and, a listing of facts fundamental to the importance of agricultural exports. This program concentrates on the three main agricultural products of Indiana, namely: corn, soybeans, and hogs. Following a fact sheet about each of these three products, several activities relating to that product are proposed. Each activity contains proficiency indicators for the targeted discipline, required materials for that activity, and directions for successful student participation. The appendix contains a catalog of organizations that provide free or inexpensive resource materials and services that are available to classroom teachers. (JJK)

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INTERNATIONAL AGRI-AWARENESS



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FOREWORD

One of the greatest challenges facing Indiana and our nation today is educating our youth for the future. As a teacher, you are charged with this exciting and challenging responsibility. Preparing young people for the future is a big task. As educators, you shoulder that burden – teaching students the fundamentals, as well as the many practical aspects of coping with a changing world. Agriculture is a topic that affects your students' lives.

This program contains exciting and interdisciplinary activities, resources, and support to help prepare you to teach important international agricultural concepts to your students. This program encourages you to "reach out" to your community and involve farmers, parents, soil experts, agriculture businesses, senior citizens, and other agricultural organizations and associations. Together, you can study and trace corn, soybeans, pork, and other important agriculture products as they are exported from your community to many parts of the world.

We feel this program will add excitement and adventure to your classroom. It will provide each of your students with experiences which will motivate them to read and learn more about Indiana agriculture products. Dare to be different! Reach out and touch the world of agriculture with your students.

H. Dean Evans
Superintendent of Public Instruction

Robert Book
Chairman
Indiana Agriculture Awareness Council

ACKNOWLEDGEMENTS

The Indiana Department of Education appreciates the agriculture education support and assistance provided by the following individuals and agencies who helped design this interdisciplinary International Agriculture Education module:

Betty Johnson, Chief, Office of School Assistance, Department of Education

Marty Alenduff, Department of Education

Phillip Anderson, Indiana Corn Growers Association

David Ballard, Department of Education

Frederick Bein, Indiana University-Purdue University at Indianapolis

Douglas Boline, Indiana Agricultural Statistics Service

Bob Book, Indiana Institute of Agriculture, Food and Nutrition, Inc.

Bob Cherry, Indiana Farm Bureau, Inc.

Harlan Day, Department of Education

Patricia Douglas, Department of Education

Terry Fleck, Indiana Pork Producers Association

Mary Fortney, Department of Education

Linda Dunn-Halfaker, Department of Education

Mike McGovern, Soil Conservation Service

Harry Pearson, President, Indiana Farm Bureau, Inc.

Barbara Pedersen, Christa McAuliffe Fellow, Department of Education

Jerry Peters, Purdue University

Doug Pond, Department of Commerce

Dewey Stewart, Department of Education

Eric Stone, Department of Education

Joe Wright, Department of Education

Juma Bandawal, Chair, Department of Education

INDIANA

Indiana is a small state with a large population. It covers the smallest area of any state in the midwest. In fact, no other state west of the Appalachian Mountains is smaller, except Hawaii. Indiana ranks 38th in size among all the states, but is 12th in population. It is one of the 10th leading states in farming and manufacturing.

Indiana is called the Hoosier state and its people are known as Hoosiers. This famous nickname may have come from the Indiana pioneer's traditional greeting: "Who's there?" or Hoosier may have come from husher - a slang word for a fighting man who could "hush" others with his fists.

Indiana has broad fertile plains that help make it a leading farm state. These plains form part of the rich midwestern corn belt and corn is Indiana's chief crop. Hoosier farmers also grow wheat and soybeans. But manufacturing is Indiana's chief source of income. Indianapolis is the capital and the largest city in Indiana and it is served by more interstate highways, than any other major American city and is within a day's drive of more than 115 million people. The great natural beauty of Indiana makes the state a popular vacation area. Many tourists enjoy the famous sand dunes along Lake Michigan. The state's plentiful lakes and streams provide boating, fishing, and swimming. The Hoosiers chose "The Crossroads of America" as their state motto because of Indiana's central location.

The area of Indiana is 36,291 square miles, located at about 40 degrees North latitude and 86 degrees West longitude in the eastern half of the coterminous states.

Indiana ranks among the nation's leading states in agricultural production and is a major world supplier of farm commodities. Indiana processed foods contribute importantly to the United States export trade.

Climate

Indiana has a humid climate, with cool winters and warm summers. The average January temperature ranges from 27 degrees Fahrenheit (-3 degrees Celsius) in northern Indiana to 34 degrees Fahrenheit (1 degree Celsius) in the south. In July, the temperature averages 75 degrees Fahrenheit (24 degrees Celsius) in the north, and 77 degrees Fahrenheit (25 degrees Celsius) in the south. The state's lowest temperature on record, -35 degrees Fahrenheit (-37 degrees Celsius), was at Greensburg on February 2, 1951. The highest temperature, 116 degrees Fahrenheit (47 degrees Celsius), was recorded at Collegeville on July 14, 1936.

Geographical differences within Indiana help vary the state's weather. The land gradually rises from West to East, causing the average temperature to decrease. Lake Michigan effects the climate of northwestern Indiana. The lake warms the northwest winds during the winter and cools them in the summer. The many hills and valleys of southern Indiana cause the temperatures in the region to vary greatly within short distances. Rainfall averages 30 inches (91 centimeters) a year in northern Indiana and 43 inches (109 centimeters) in the south. Dry periods and floods occasionally occur in the southern section, especially in the Ohio River Valley.

Snowfall ranges from more than 40 inches (100 centimeters) a year in the north section to about 10 inches (25 centimeters) in the South. Severe thunderstorms and tornadoes are common in Indiana. The state generally averages 200 thunderstorms and 22 tornadoes per year.

Property damage is greatest from lighting and high winds during thunderstorms, while hail may result in devastating crop damage in small areas during summer months. Although these violent weather patterns may develop during any month, March through July is characterized as the "severe weather season." Indiana ranks ninth in the nation in terms of the total number of tornadoes. When state size is considered in determining the number of tornado events, Indiana is second only to Oklahoma. With reference to the risk factor associated with tornado occurrences - the prospect of property damage, injury, and death related to tornado frequencies - Indiana ranks fifth in the nation.

Natural Resources

Fertile soil is one of Indiana's greatest natural resources. Other resources of the state includes mineral deposits and plentiful water.

Soil combining clay, sand, and silt covers the northern two-thirds of Indiana. This type of soil, called loam, ranges in color from light brown to black. Melting glaciers from the Ice Age left the soil deep and rich in minerals. Soils in the southern third of Indiana are thinner and less fertile. They consist of heavy clays, brown silt loams, or yellowish soils of silt and sand.



INTERNATIONAL AGRICULTURAL AWARENESS

Rationale (Need)

No greater challenge faces Indiana's educators today than the commitment to prepare students for responsible roles in an increasingly shrinking world. It is no longer sufficient to prepare students solely for their adult roles in American life because the affairs of America are interdependently linked to those of other nations of the world.

Technological progress in communication and transportation within the past 30 years inevitably have made many areas of the world accessible and interdependent. Information can be transmitted to many places instantly and people can now travel to almost anywhere in the world in a matter of hours. Failure to understand the concept of interdependency greatly diminishes the potential of all nations and each citizen to appreciate the world community.

The clear understanding of agricultural education is an important condition for survival. The materials in this agricultural curriculum module may be used as a supplement by integrating its content into existing courses of the school curriculum.

This agricultural curriculum module addresses the development of attitudes and competence related to international relationships, cultural diversity, oneness of the human species, individual participation in an international society, diverse perspectives and values, and an understanding of current world conditions.

Curriculum Module Description

This international agriculture awareness curriculum module will involve students in activities and experiences that provide a better knowledge-base about Indiana's agricultural exports and how these exports effect Indiana's economy and its citizens. Students will also explore agriculture products imported to Indiana and the impact of these products on Indiana's economy and its citizens.

This curriculum module will provide students with direct experiences as they interview farmers, trace Indiana's agricultural products, visit local farms, communicate with students and farmers from other nations, and locate their countries on a world map.

Evaluation

The goals and activities in the international agriculture awareness curriculum module are correlated with the Indiana Curriculum Proficiency Guide. This means the activities in the curriculum module will prepare students to become more knowledgeable and proficient in agriculture, social studies, math, science, health, and language arts.

FOCUS

To provide students with a knowledge-base about the agricultural products imported and exported from Indiana. The goals and activities in this curriculum module have been correlated with the Indiana Curriculum Proficiency Guide. The goals and foundation proficiency statements in this module are listed below.

Goals to Develop:

1. Global mapping and thinking skills by tracing Indiana's agricultural products and appreciation of heritage towards agricultural exports on the Indiana citizens.
2. An understanding of the economic impact of Indiana's agricultural products on the world.
3. An agricultural communication network with schools or farmers from foreign countries.
4. A global understanding of agricultural interdependency.
5. An understanding of the diverse technological processes involved in agriculture.
6. An understanding of the career potential in Indiana agriculture.
7. An understanding of the resources (natural and commercial) required to produce and market agricultural products in Indiana and foreign nations.

State Proficiency:

1. Mapping and tracing skills. Understanding Indiana's relationship to world.
2. Explaining interactions of people and institutions. Describe resources and trade relationships.
3. Communication skills, writing skills, and creativity.
4. Comprehending relationships. Recognizing distribution patterns of world. Identifying physical features.
5. Research skills. Analyze technology. Predicting and estimating.
6. Researching, predicting, and tracing.
7. Describe interrelationships. Analyze current resources available in nations. Identify patterns of trade. Explain interactions of human resources.

8. An understanding that different cultures use different technologies.

9. An understanding that climate, natural resources, and soil types determine the agricultural products of a nation.

8. Describe forces that shape values. Compare cultural diversities. Explain interactions of cultures with technology. Identify patterns of behavior in different cultures when using technology.

9. Research climate, natural resources, and soil types. Compare economic systems. Predict growing seasons. Hypothesize how products can improve.



IMPORTANCE OF EXPORTS

The United States is the world's largest exporter of agricultural products. The relationship between a thriving American agriculture and the well-being of the nation's people is often overlooked. Yet, the two are so closely linked that whatever affects one affects the other. Without consumers, farmers would be out of business; without farmers, consumers could not survive.

A close relationship also exists between American agriculture and foreign countries. American farmers increasingly depend on foreign markets. Other nations depend more and more on American farmers for their food and fiber needs. Exporting is an important part of the economics of the United States and the State of Indiana.

2/5 of farmland in this country produces products for export.

1/8 of America's manufacturing jobs depend directly on foreign trade.

1/4 of our gross national product (GNP) involves either exports or imports.

Each billion dollars in exports supports 25,000 jobs. More than a million jobs are supported by farm exports. The State of Indiana produces \$1.7 billion in agricultural exports. More than 90,000 Indiana manufacturing jobs are dependent on exports.

Each day more than 10 ships leave United States ports carrying farm exports to overseas customers.

American farmers supply the world agricultural markets with nearly one-half of all their wheat and corn and two-thirds of all soybeans available to foreign countries.

Farm exports create over a million jobs for Americans.

Two out of five crop rows of America's soybeans are exported to Japan and Western Europe.

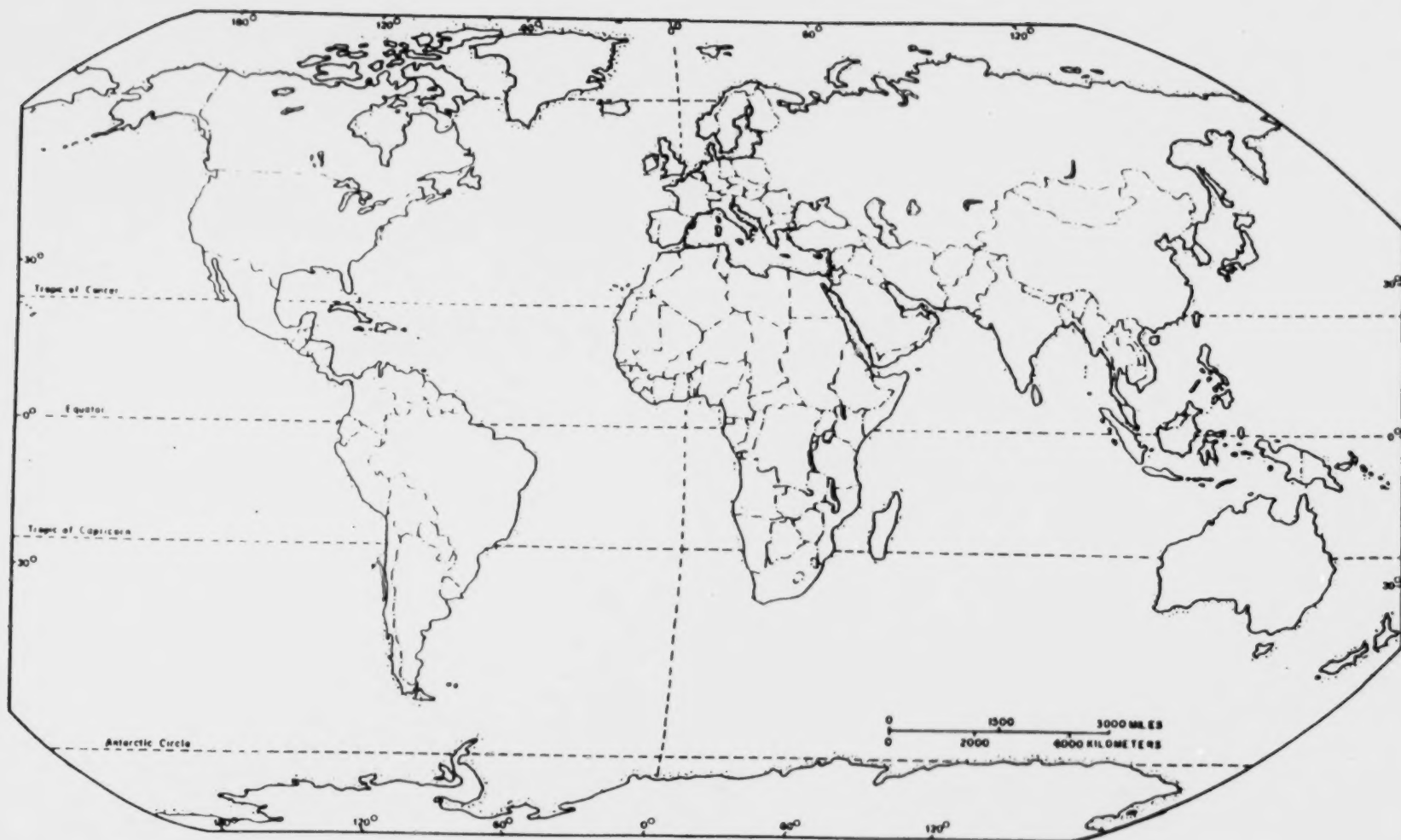
United States exported 21,493,000 metric tons of soybeans (5,468,242,000 bushels) during 1987-88 and an additional 700,000 metric tons (274,800,000 bushels) of soybean meal.

In 1988, Indiana's soybeans and products were valued at \$17,200,000.

Indiana is one of the leading agricultural states and producer of farm products. It provides an annual income of about \$5 billion. It is a leading state in soybeans, popcorn, corn, tomatoes, chickens, hogs, and turkey products.

The five leading exporters of soybeans in the world are the United States, Argentina, Brazil, China, and Paraguay.

The three leading countries in hog production are China, the Soviet Union, and the United States respectively.



FACT SHEET

Corn

Corn was first used for food about 10,000 years ago by Indians living in what is now Mexico. About 5,000 B.C., they learned how to grow corn themselves. Corn, also called maize, is a plant whose food value and wide variety of use make it the most important crop grown in the United States. It is also one of the most important crops in the world. In world grain production, corn ranks second, after wheat. Rice is a close third. These three grains are the chief sources of energy in the human diet.

Corn has an amazing number of uses. The kernels (corn grain) can simply be cooked and eaten. The kernels can also be used in making breakfast cereals, baked goods, salad dressing, and many other foods. Large quantities of corn grain, as well as cornstalks and other parts of corn plants, are fed to livestock.

When people eat meat, eggs, and dairy products they are indirectly eating corn through the food chain. Corn is also used in making many kinds of nonfood products including ceramics, drugs, paints, paper goods, and textiles.

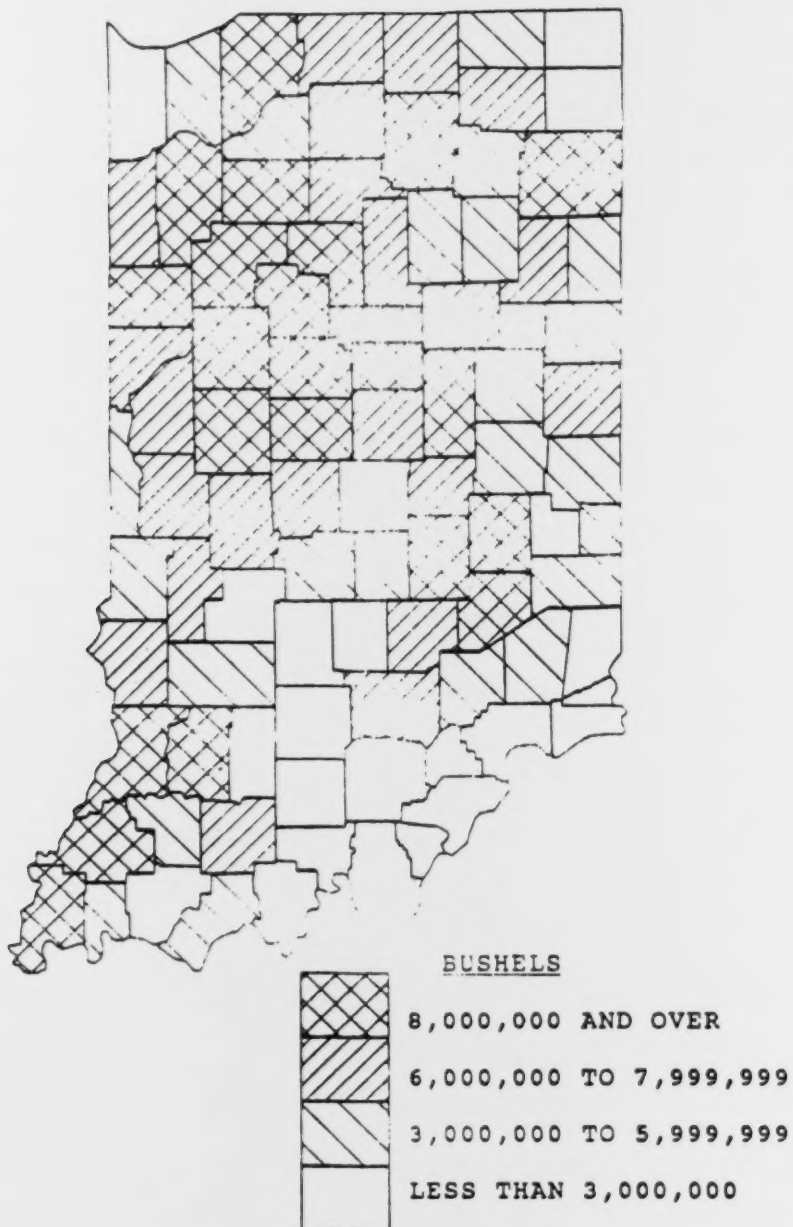
The United States is the world's leading producer and exporter of corn. It produces about two-fifths of the world's supply, chiefly in a region of the midwest called the Corn Belt. In 1988, corn fields occupied 5,150,000 acres of land in Indiana.

In many developing countries in Latin America, Africa, and Asia corn forms a major part of human diet. Corn also serves as an important ingredient in many processed foods. A typical supermarket in the United States or Canada might carry more than 1,000 foods that contain corn or corn products.

China is the second largest producer of corn. It accounts for about a seventh of the world's supply. Other leading producers include Argentina, Brazil, France, India, Mexico, Romania, the Soviet Union, and Yugoslavia. In Canada, the leading corn producing provinces are Ontario, Quebec, and Manitoba.

Argentina, South Africa, and Thailand are among the leading corn exporting countries. Japan is the largest importer of corn and the Soviet Union ranks second. Other major importers include Mexico, South Korea, and Spain. Indiana is the fourth leading corn growing state; Iowa, Illinois, and Nebraska are first, second, and third respectively.

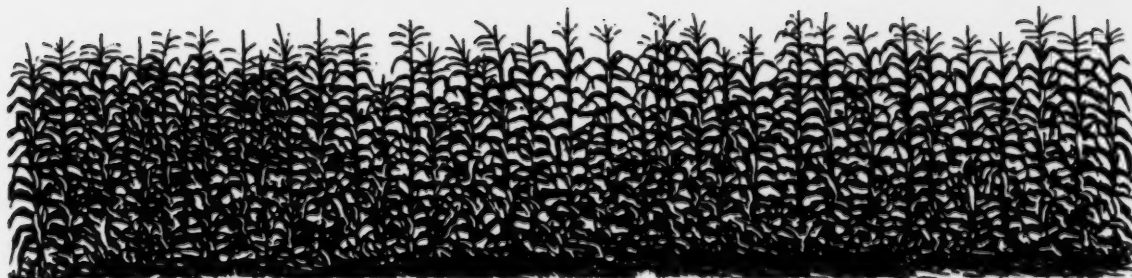
1988 CORN PRODUCTION



From October 1987 to September 1988, the United States exported 44,494,830 metric tons (MT) of corn to 107 countries in the world. The largest importers were:

1. Japan	-	14,833,324	MT
2. Soviet Union	-	4,976,077	MT
3. Korea	-	4,417,479	MT
4. Taiwan	-	4,171,683	MT
5. Mexico	-	3,142,380	MT
6. Spain	-	1,832,235	MT

1 metric ton = 39.4 bushels



AGRICULTURAL AWARENESS ACTIVITIES

Activity 1: Where In The World Is Indiana Corn?

Proficiency/Indicator:

Social Studies

Students should be able to describe the geographical patterns and interrelationships of the major physical and cultural features on the earth's surface.

Geography Themes: Relative location and movement

- a. students will distinguish political divisions on maps and globes.
- b. students will identify Indiana and its trading partners on a world map.
- c. students will estimate relative distance between places using maps and globes.
- d. students will use maps to show how Indiana is linked to other nations of the world by transportation systems.

Materials:

Large globe, world wall map, or other world map showing political divisions, colored yarn, thumb tacks or tape, three or four large sheets of poster board or foundation construction paper for making charts, and magic markers.

Directions:

Pose the following question to students: Who buys Indiana corn? Using the map, have students speculate about which nations of the world might have reasons to buy Indiana corn.

After students have generated some ideas, share the following information:

The nations which buy the largest amount of corn from Indiana are: Japan, the Soviet Union, Korea, Taiwan, Mexico, and Spain.

Write the names of these nations on the chalkboard or on a piece of poster paper. The number of metric tons could also be listed. Have students locate each nation on the map and then attach strips of yarn leading from Indiana to each one. Have students use the scale of miles to estimate the distance between Indiana and each country. Using construction paper or poster board, have students make a chart showing the estimated miles that Indiana corn travels to reach each of the corn buying nations.



Extended Activity:

Directions:

Using a map or globe, have students list ways that large amounts of corn could be transported from Indiana to Japan, the Soviet Union, Korea, Taiwan, Mexico, and Spain. Possible modes of transport include: trucks, trains, river barges, ocean-going ships, and airplanes. Have students draw or find pictures of each type of transportation. Pictures could then be added to the map or chart described on the previous page.

Note: These activities also may be used to examine the questions of who buys other Indiana agricultural products such as soybeans and hogs.



Activity 3: Dancing and Singing Rain

Proficiency/Indicator:

Fine Arts Share creative drama activities with others.

Materials: Folktales from various cultures where the importance of corn is stressed. Tape recorder, simple instruments.

Directions: Share with students how a culture's religious beliefs may affect its farming practices. Superstitions and ritual practices may be discussed.

Create a ceremonial dance that might be used by various cultures to encourage rain, sun, fertile soil, etc., along with your story.



Activity 4: LIGHTS CAMERA ACTION
A STAR IS CORN!

Proficiency/Indicator:

Fine Arts Use creative drama to tell a story. Share creative drama activities with others.

Materials: Corn products from the garden and the grocery or department store.

Directions: Ask student to bring in products from home that contain corn or are made from corn. Discuss all of the products and share with the class.

Divide into small groups to categorize the products: cereals, baked goods, salad dressing, ceramic, paints, paper goods, etc. Then, as a large group, brainstorm possible ways to create a play that traces the origin of everyday products back to corn.

Assign different responsibilities - scripts, props, publicity, etc., and begin the project.

Activity 5: An A"maiz"ing Tale

Proficiency/Indicator:

Fine Arts

Use creative drama to tell a story. Create with a variety of 2 or 3 dimensional media e.g., drawing, paints, sculpture, etc.

Materials:

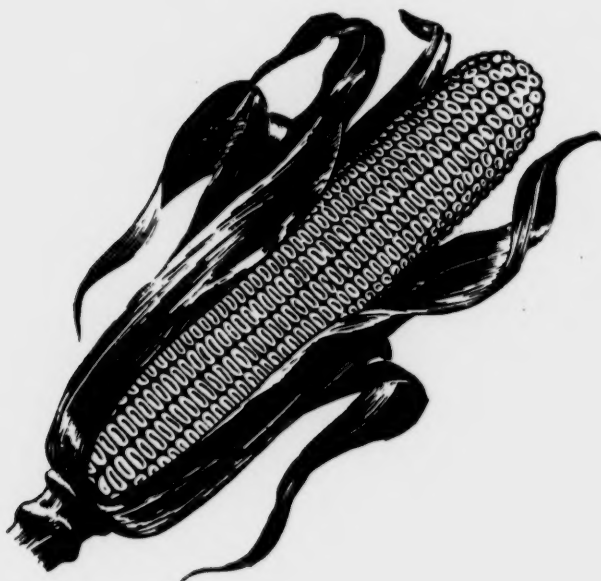
Folktales from around the world that highlight the importance of corn in the culture. Example: "The Magic Food," an Iroquois folktale.

Directions:

Gather several folktales where the culture depends upon corn for its food supply and livelihood. Divide the class into groups based upon each folktale or country and read the story. Create a play based upon the folktale or rewrite the tale in a reader's theater format. Share your drama with others.

Extended Activity:

Make corn husk dolls, using the husk, kernels, silk, cobs to create characters for your play.



Activity 6: Words to Influence

Proficiency/Indicator:

Language Arts Recognize how advertisers can manipulate language for specific purposes.

Materials: Cut tagboard into 3 inch by 8 inch pieces. Corn products in containers.

Directions: Ask students to bring in products from home that contain corn. Students share their product and display them on a table.

Working in groups the students study the containers and make a list of words that are used to influence or to purchase that product.

The words are written on colorful pieces of 3 inch by 8 inch tagboard and placed on a bulletin board.



Activity 7:**Corn Science****Proficiency/Indicator:****Science**

Predict interaction for water, soil, and temperature on corn kernels. Compare observations of the growth of corn in different light settings.

Materials:

Paper towel, thermometer, paper cups, kernels of corn, different types of soil.

Directions:

Working in small groups or individually, students will:

1. Research and list the conditions that allow corn to grow.
2. Place 10 kernels of corn in a damp paper towel (keep moist and at room temperature) and record the growth of the roots each day on a bar graph for 10 days.
3. Transplant each successful germinated corn plant into a paper cup filled with soil. Place half of the cups of planted corn in a dark area and the other half in a lighted area. Record the growth of the stalks each day for 30 days. Draw conclusions about corn plants growing in light areas as compared to dark areas.
4. Plant kernels of corn in different types of soil (clay, sand, loam) and record the growth of each. Make comparisons of the growths and record conclusions.
5. Research and record organic soil enrichment practices to produce acceptable healthy corn by farmers in the United States.



Activity 8: Mathematics and Farm Production

Proficiency/Indicator:

Mathematics Communicate mathematical ideas in oral and written form. Recognize problem solving as the focus of higher order thinking skills in mathematics.

Materials: Chalk, chalkboard, pencil, and notebooks (for students).

Directions: Select one of the following problems, and ask the students to participate in the solution of the problem.

Problem #1

A corn bin is built that is 20 feet across and 15 feet high.

- a. What is the volume of this bin?
- b. If a bushel of shelled corn is equivalent to 0.8 cubic feet, how many bushels of shelled corn can this bin hold? (Round to the nearest 10 bushels).

Problem #2

A farmer receives \$.25 out of each dollar a consumer spends on corn products. At this rate, about how much does the farmer receive out of a consumer's corn product purchases of \$90.

Problem #3

The cost of transporting corn limits how far a farmer is willing to move his corn to market. The Baileys looked over their records for the past several trips to a distant market. The labor and fuel expenses were \$62, \$55, \$58, \$70, and \$61. On the above trips they delivered 98 bushels, 102 bushels, 95 bushels, 107 bushels, and 90 bushels, respectively.

- a. About how much does it cost in labor and fuel for each trip to this distant market?
- b. About how many bushels are the Baileys able to deliver on each trip?
- c. Using these estimated averages, about how much does it cost in labor and fuel per bushel to deliver the products to market?

Activity 9:**Solve Word-Problems Involving Agriculture****Proficiency/Indicator:****Mathematics**

Develop strategies for solving problems through translating relevant verbal and physical data into mathematical language.

Materials:

Calculator

Directions:**Problem #4**

John Smith raises corn as a cash crop in the rural area of Benton County. On March 25, he needed some operating cash to plant his crop. He decided to sell 30,000 bushels of the corn that he would produce on the futures market. He received \$3.20 per bushel and agreed to deliver 30,000 bushels of corn in early October. He produced 60,000 bushels of corn. He received \$3.70 per bushel for the 30,000 he had not sold on the futures market.

- a. What is his gross income from the corn crop?
- b. Instead of selling on the futures market, John could have borrowed \$70,000 at 8 percent single interest rate and due in October. (He would have to pay back the \$70,000 plus 8 percent of the \$70,000). Would this have been a better alternative for John?

HINT: Compare the answer in question a to the interest he must pay if he borrows the money.

Problem #5

A six-row corn combine can harvest about 315 pounds of corn each minute.

- a. Estimate how many 55-pound bushels of corn the combine can harvest each hour.
- b. Use your calculator to find the exact answer. Round your answer to the nearest bushel, and compare this to your estimate.

Problem #6

Debbie lives on a farm with her parents. She has just been given a young calf to raise and to eventually show at the county 4-H fair. Debbie needs to know how much it will cost to feed the calf as it grows. Look at the following data:



Yearly Feed Consumption for an Average Cow

Silage	5,600 pounds
Hay	2,100 pounds
Grain	2,200 pounds

Question A: Determine the average feed per month she might need for each type of feed.

Question B: What data is missing which prevents Debbie from solving her problem? Where could she possibly find the missing information?

Problem # 7

The table below lists the average corn yields for several countries over a certain time span.

Average Corn Yields (pound per acre)

Brazil	677
Canada	1301
France	2500
India	623
Japan	000
Mexico	2050
Spain	1099
United States	1652
Russia	936

- What is the median corn yield?
- What is the mean corn yield?
- What is the range of the corn yield?

Problem #8

Look at the following chart and answer the questions:

<u>State</u>	<u>Annual growth (bushels)</u>
Iowa	1,736,800,000
Illinois	1,453,549,000
Nebraska	801,600,000
Minnesota	743,600,000
Indiana	650,000,000
Wisconsin	375,000,000
Ohio	350,000,000
Michigan	272,550,000
Missouri	212,300,000
South Dakota	170,000,000

- Find the total corn produced by these states. Can you express your answer in scientific notation?
- If each bushel is about 56 pounds, how many pounds of corn did these states produce?



Activity 10:

Popcorn Poem

Proficiency/Indicator:

Language Arts

To enjoy the sounds and rhythms of words.

Materials:

Popcorn, paper, heat plate, and pencils.

Directions:

Brighten up a dreary day with the smells and sounds of popping corn.

Each student has a sheet of paper. At the top of the paper, the student writes the word "pop," or "pops," or "popping." As the corn is popping, each student lists as many words as he/she can that rhyme with the word at the top of the page. The students then write poems, using these words, as they eat the hot popcorn.

pop
hop
top
stop

* Lots of possibilities for varying this activity.



Activity 11: Analyzing Farm Productivity

Goal: An understanding of the diverse technological involved processes in agricultural production.

Proficiency/Indicator:

Economics Compare and contrast how education and technology influence the economic characteristics of various countries.

Content: Productivity is the ratio of the output (goods and services) of production divided by the input (productive resources) of production. Since labor input is relatively easy to measure and since it relates directly to wages and living standards, the term productivity commonly refers to labor productivity, and is measured in terms of output per unit of labor hour (man hour) worked.

Societies constantly are striving to increase productivity, since this will result in higher standards of living. Some of the most basic ways to increase productivity are:

1. Using more capital resources.
2. Improvements in technology.
3. Increased specialization in production.
4. Improvements in education and training for workers.
5. Better organization of production.

Directions:

1. Define and discuss the concept of productivity. Have students identify ways that farmers have increased productivity during the past 190 years (Answer - more and better capital equipment, better hybrids, better fertilizers, better agricultural techniques, etc.).
2. Analyze the table on wheat, corn, and cotton yields. Ask the students questions about data in the table. Also compute labor productivity using the data.
Examples:
 - a. What was yield per acre for corn in 1840? (25 bushels) in 1970? (71.6 bushels)?
 - b. How many man-hours did it take to produce 100 bushels of corn in 1900? (147) in 1970 (7).
 - c. What was the labor productivity of corn production in 1900 i.e., bushels per man-hour? (Labor productivity equals Output/Man-hour, so labor productivity = $100/147 = .68$ bushels per man-hour.



- d. What was the labor productivity of corn production in 1970? ($100/7 = 14.29$ bushels per man hour.)
- Have students prepare bar graphs or pie graphs using the data and computations from the table.
 - Have students do reports on inventions and innovations that have greatly increased farm productivity.
 - Research data on productivity in other countries. How does it differ from United States productivity? Prepare bar graphs showing the differences. Discuss why the productivity is different. In farming, the most significant factors in increasing productivity have been the use of more capital and technologically improved capital.

Series K 445-485. Man-Hours Per Unit and Yield Per Unit of Production of Selected Crops and Livestock: 1800 to 1970

(Figures for 5-year periods are annual averages)

Year	Wheat					Corn for grain					Cotton				
	Man-hours per acre			Yield per acre ¹ (bu.)	Man-hours per 100 bushels	Man-hours per acre			Yield per acre ¹ (bu.)	Man-hours per 100 bushels	Man-hours per acre			Yield of lint per acre ¹ (pounds)	Man-hours per bale ²
	Total	Before harvest	Harvest			Total	Before harvest	Harvest			Total	Before harvest	Harvest		
	445	446	447			450	451	452			455	456	457		
1970.....	2.9	1.8	1.1	31.0	9	5.2	2.9	2.3	71.6	7	24	21	3	438	26
1965-1969.....	2.9	1.8	1.1	27.4	11	5.8	3.3	2.5	77.4	7	30	22	8	485	30
1960-1964.....	3.0	1.9	1.1	25.2	12	7.0	4.3	2.7	62.2	11	47	23	24	475	47
1955-1959.....	3.8	2.3	1.5	22.3	17	9.9	6.5	3.4	48.7	20	66	35	41	438	74
1950-1954.....	4.6	2.6	2.0	17.3	27	13.3	8.9	4.4	39.4	34	66	38	36	296	167
1945-1949.....	5.7	2.9	2.8	16.9	34	19.2	12.2	7.0	36.1	63	83	39	45	273	146
1940-1944.....	7.5	3.8	3.7	17.1	44	25.5	16.0	9.5	22.2	79	99	46	53	260	182
1935-1939.....	8.8	4.3	4.5	13.2	67	28.1	17.9	10.2	26.1	106	99	47	62	225	209
1930-1934.....	9.4	4.6	4.8	12.5	70	28.2	17.6	10.6	23.0	121	97	63	44	184	252
1925-1929.....	10.5	5.1	5.4	14.1	74	30.3	17.9	12.4	25.3	115	96	69	37	171	268
1920-1924.....	12.4	4.9	4.4	19.8	90	32.7	19.2	13.5	26.8	122	96	69	27	155	296
1915-1919.....	13.4	6.6	7.0	13.9	98	34.2	20.0	14.2	25.9	132	105	62	43	168	299
1910-1914.....	16.2	7.0	8.2	16.4	106	35.2	20.4	14.8	26.0	135	116	64	62	201	276
1900.....	16.0	7.0	8.0	13.9	108	38.0	22.0	16.0	23.9	147	112	62	50	189	284
1880.....	20.0	8.0	12.0	13.2	152	46.0	23.0	19.0	25.6	180	119	67	62	188	303
1840.....	26.0	12.0	22.0	16.8	233	69.0	44.0	25.0	25.0	276	135	90	45	147	438
1800.....	36.0	16.0	40.0	15.0	373	86.0	56.0	30.0	25.0	346	183	135	60	147	601

See footnote at end of table.

Historical Statistics of the United States: Colonial Times to 1970, Part 1, United States Department of Commerce, 1975, p. 500

Activity 12: Interdependence: Trading Links Around the World

Goal: That students will have a global understanding of agricultural interdependence.

Proficiency/Indicator:

Economics Identifying product distribution patterns in the world; explain how interdependence is the result of specialization.

Content: Because of specialization and trade the countries of the world have become increasingly interdependent. This means that countries depend on each other for providing many goods and services, including agricultural products. For example, countries that do not specialize in hog production depend on the United States for much of their pork. We, in turn, depend on other countries for agricultural products, such as bananas and coffee. This high level of interdependence helps countries to enjoy a much higher standard of living than they would have without trade.

Directions: Label Search



1. Have students bring to class many food labels. They should bring a large variety of labels which include many products from around the world. On a world map, identify with pins the countries from which the food items come. Discuss how we depend on these countries for food products. Also discuss how these countries depend on us for agricultural products, such as corn, soybeans, and hog products.
2. Discuss the productive resources (natural resources, human resources, capital resources) that these countries have which make it possible for them to produce these foods.
3. Divide the class into groups of four or five. Each group must design a menu using foods produced from around the world. Students should design well-balanced meals. Students should also identify which food products contain pork, soybeans, or corn.

Note: This lesson was adapted from a lesson in *Teaching the Economics of the Food and Fiber System: 4-6 Intermediate*, published by the Arkansas State Council on Economic Education.

Activity 13:**Going Places: Indiana's Link to the World****Proficiency/Indicator:****Language Arts**

Locate specific land forms, countries, states, and cities on maps and globes.

Materials:

Various colors of bulletin board paper, scissors, glue, kernels, yarn, markers, literature and resource books, newspaper, magazines, and travel brochures.

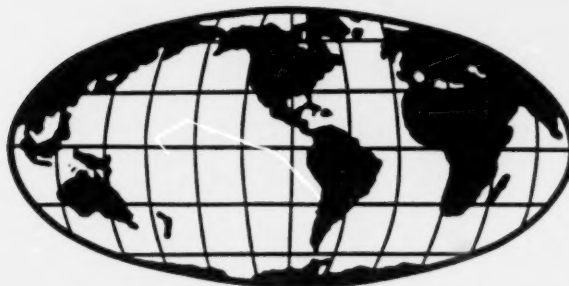
Directions:

Conduct a brainstorming session with students listing what comes to mind when they think of corn.

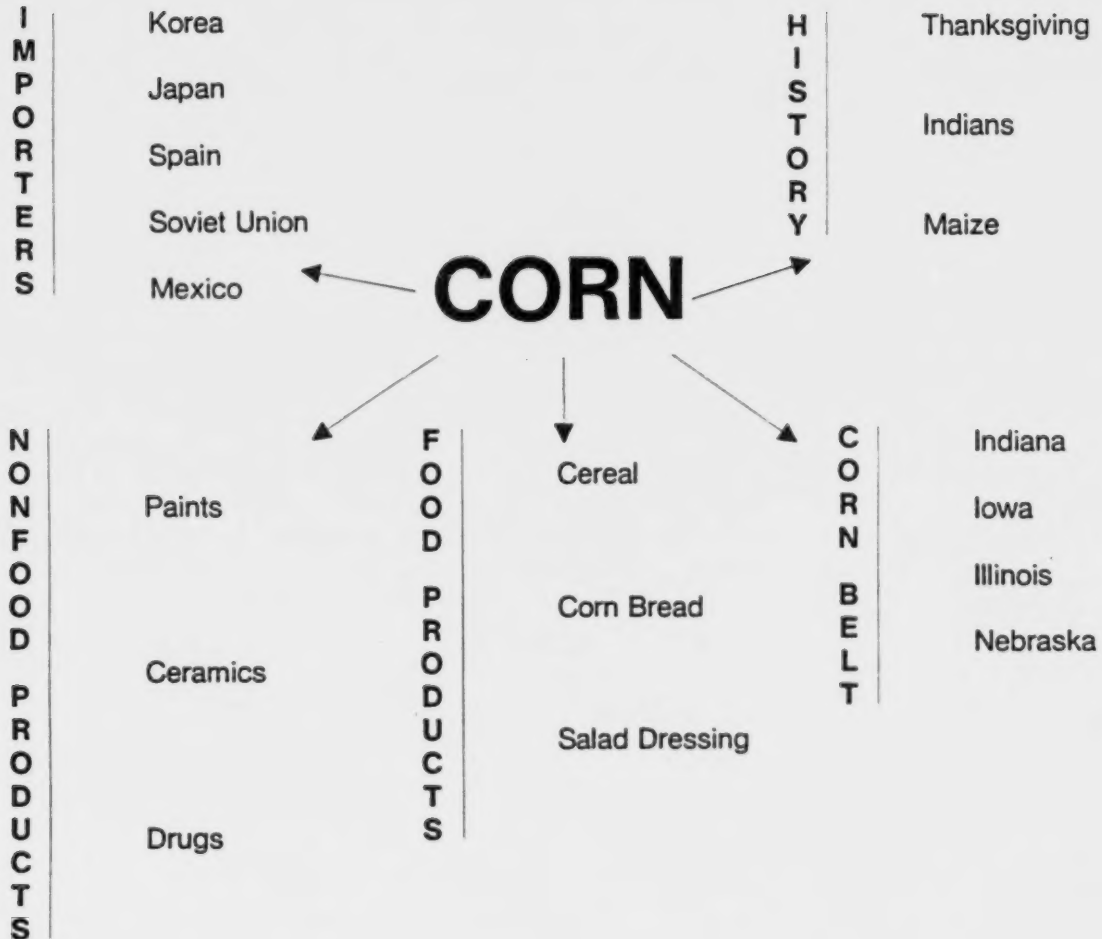
When a sizable group of words and phrases have been generated, students will be asked to identify categories for clustering the words using a semantic map.

After students have exhausted their knowledge about the topic, they should be asked to develop questions about gaps in their knowledge about corn. These questions can be written down on the board or by students individually or in pairs.

Have the students read books, newspapers, magazines, and travel brochures to search for answers to their questions and also search for new ideas. Examine the semantic map from the perspective of the information that has been gained from reading; when necessary, map items should be reorganized to better illustrate their interrelationships.



SEMANTIC MAP



Examine the semantic map from the perspective of the information that has been gained from reading; when necessary, map items should be reorganized to better illustrate their interrelationships.

Sample Questions

Read to find out:

1. What states other than Indiana are part of the corn belt?
2. What nonfood products are made from corn?
3. What countries are the major importers of corn?

Ask students to select one category above and construct an activity for the topic.

Sample Small Group Activity

- First, cut a large circle from bulletin board paper to depict the earth.
- Second, cut shapes to resemble the continents and glue them on the circle.
- Third, on those continents, outline the boundaries of countries that are importers of corn and estimate the physical and cultural characteristics about the country.
- Fourth, link the kernels of corn with glue from the corn belt to the countries where corn is imported. (Option - use yarn instead of kernels.)
- Last, display the map in the classroom and use as a point of reference for current events during the year.

FACT SHEET

Soybeans

Soybeans are one of the oldest crops raised by human beings. Historians believe the plant first grew in Eastern Asia and was cultivated about 5,000 years ago. The ancient Chinese considered soybeans their most important crop and one of the sacred grains necessary for life.

Soybeans were introduced into Europe during the A.D. 1700s, but were not cultivated extensively until the 1900s. In the United States they were used primarily as forage until the 1900s. Most soybean meal was used as fertilizer until the mid 1930s. At that time, the meal became widely used in feed for livestock and poultry.

Soybeans are valuable in easing the world food shortage. Soybeans grown on an acre of land can provide about ten times as much protein as can beef cattle raised on the same land. Soybeans provide more protein than most other vegetables or grains; therefore growing soybeans is one of the most efficient uses of land. More and more people are realizing the protein value of the soybean and relying on it to supply their protein needs.

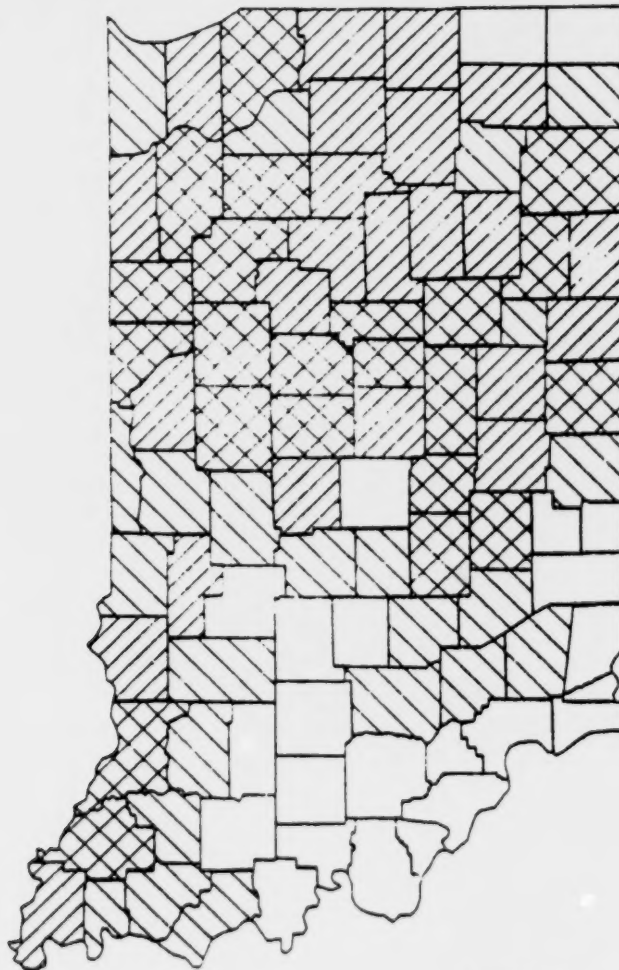
Soybean is a plant that supplies feed for animals, food for human beings, and raw materials for industry. Farmers in the United States grow more soybeans than any other cultivated crop except corn and wheat. Soybeans are also the nation's largest single source of vegetable oil and protein meal for livestock. In 1988, soybeans were cultivated on 4,200,000 acres of land in Indiana.

The soybean is one of the world's most useful and cheapest sources of protein. It contains about 40 percent crude protein, compared with eighteen percent for beef and fish. People in many countries eat soybeans instead of other sources of protein such as meat, eggs, and cheese.

The United States grows more soybeans than any other country. Other important producers include Brazil, China, Argentina, Canada, Indonesia, Mexico, and Russia. Illinois usually ranks first among the states in the production of soybeans, followed by Iowa and Indiana. Ontario is the leading soybean producer among the Canadian provinces.

The United States supplies about two-thirds of the world's soybeans. Soybeans are grown on about 68 million acres (27.5 million hectares) of land in the United States. The nation produces about 1.8 billion bushels of soybeans annually. About 40 percent of the crop is exported to western European nations, Japan, and other countries. Soybeans are grown in few areas of the world.

1988 SOYBEAN PRODUCTION



BUSHELS



2,000,000 AND OVER

1,000,000 TO 1,999,999

500,000 TO 999,999

LESS THAN 500,000

The United States exported 21,493,000 metric tons (MT) of soybeans to more than 20 countries in the world in 1987-88. The largest importers among others were:

1.	Japan	-	3,919,000	MT
2.	Netherland	-	4,363,000	MT
3.	Taiwan	-	1,706,000	MT
4.	Spain	-	1,532,000	MT
5.	Korea	-	1,040,000	MT
6.	West Germany	-	1,295,000	MT

1 metric ton - 39.4 bushels



Activity 1: Choral Reading of Planting Poems (Soybeans)

Proficiency/Indicator:

Language Arts Respond to literature in a variety of ways.

Materials: Attached copies of readings.

Directions:

1. Discuss the planting of soybeans and its importance as a crop to Indiana.
2. Discuss the rigors of being a farmer.
3. Pass out choral reading sheets attached.
4. Discuss any unfamiliar vocabulary.
5. Do choral reading of poems.



IRRIGATION

Ann Nolan Clark

*When my father
Needs water
For his thirsty fields,
He opens the ditches Girls
To let the water run slowly,
Slowly,
Around the roots
Of all the growing things.*

*My father Boys
Closes the ditches
To stop the water,
When his fields
Have finished drinking.*

*My father
Opens the ditches
When it is his day
To irrigate his fields.*

*No one Girls
Would take a day Boys
That was not his
To irrigate.*

*No one Girls
Would take too much water Boys
When it was his day
To irrigate.*

*All Indians Girls
Are taught
When they are little,
That water is good;
It must not be wasted.*

*I have known this Boys
For a long time.*

THE PLOWMAN OF TODAY

Hamlin Garland

*Upon his tractor's steady seat
He sits and drives his triple-share, ...Group
Hearing his steel bright pistons beat
Their tireless tattoo on the air.
Unwearied, recking neither wind nor snow,
Nor burning sun, scorning all insects' sting,
The ponderous monster wallows to and fro
Like some vast, captive dinosaurian king.*

PLOWING: A MEMORY

Hamlin Garland

A lonely task it is to plow. Boys

*All day the black and shining soil Girls
Rolls like a ribbon from the mold board's
Glistening curve.*

A lonely task it is to plow. Boys

*And battle with the flies, and strain Girls
Their creaking harnesses.*

A lonely task it is to plow. Boys

*All day the crickets jeer from wind-blown Girls
shocks of grain.*

A lonely task it is to plow. Boys

*October brings the frosty dawn, ...Girls
The still warm noon, and cold, clear night
When stiffened crickets make no sound
And wild ducks in their southward flight
Go by in haste; and still the boy
And toiling team gnaw round after round
On weather beaten stubble band by band,
Until at last, to his great joy
The winter's frost seals up the unplowed land.*

A lonely task it is to plow. Boys

Activity 2:

Creative Writing Using A Story Starter Picture

Proficiency/Indicator:

Language Arts

Write stories using pictures

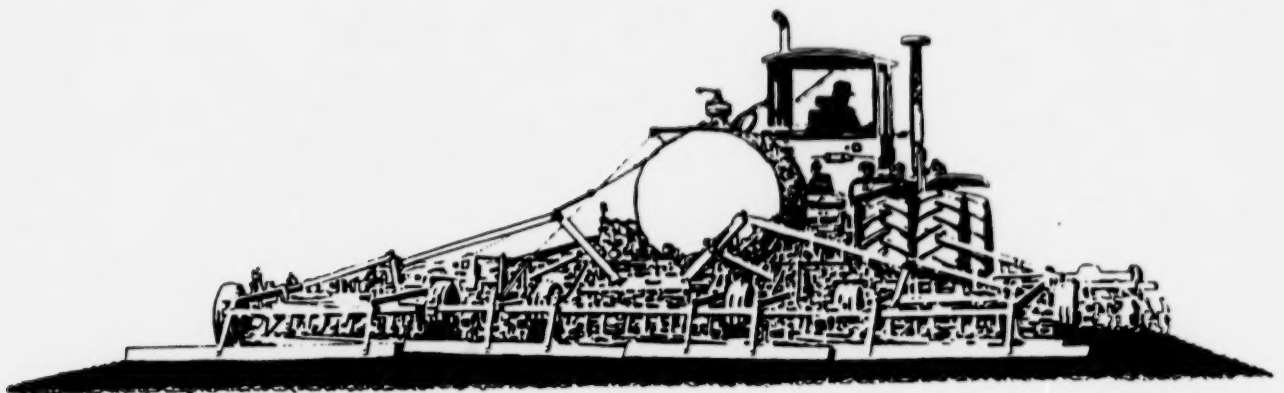
Materials:

1. Farm pictures from magazines, newspapers, and/or old basal textbooks mounted on pieces of colorful tagboard.
2. Underneath the picture list words -

farmer	bushels
fields	harvest
barn	plow
tractor	cultivate
animals	irrigation
plant	conservation
work	combine
soybeans	tile
till	rotation
forage	erosion
protein	fertilizer

Directions:

1. Students select one of the pictures.
2. Write a story using at least seven of the words listed on the picture.



Activity 3: Opportunity Cost: What Should We Produce?

Goal: An understanding of the economic impact of Indiana's agricultural products on the world.

Proficiency/Indicator:

Economics Explaining interactions of people and institutions.

Content: There is an opportunity cost to every economic decision. Opportunity cost is the best alternative when we make a choice. An individual who decides to produce corn on his 40 acres will have to forgo using that acreage for producing soybeans. In this case the value of the soybeans not produced would be the opportunity cost.

Countries also incur opportunity costs with respect to production decisions. A country who specializes in producing one product, must relinquish producing some other product. Since productive resources (land, labor, and capital) are scarce, choices must be made about what to produce, and there is always an opportunity cost to these choices.

Materials: Play dough or clay

Directions: Making Production Decisions

1. Discuss and identify the many various products that use corn or soybeans in their production.
2. Give each student a small amount of play dough. Give students 10 minutes to make either a corn product or a soybean product. Each student must tell what he or she has produced and must identify it as a corn product or a soybean product.
3. Tally how many of each kind of product (corn or soybean) was produced by the class. Record the totals on the board.

Example: Corn Products Soybean Products

9

12

4. Tell the class they may want to make changes. Perhaps the class is not satisfied with this distribution. The class should vote on whether they want more corn or more soybean products. Suppose the class votes for more corn products. Choose one of the "best" soybean products and slowly fashion it into a corn product. Repeat the process. If the students groan, merely remind them that they wanted more corn products.
5. Discuss opportunity cost. Identify the opportunity cost of getting two more corn products (Answer: giving up two soybean products). Emphasize that all countries incur opportunity costs. If a country chooses to produce certain products it must give up the opportunity to produce others.
6. As an introduction to the study of economic systems, ask students how different countries decide what to produce (Answer: In market-oriented economies the decisions of consumers and businesses responding to price changes in the economy dictate what is produced. In command economies government planning authorities make these decisions.).

Note: This lesson was adapted from Lesson 5 in *Play Dough Economics*, published by the Indiana Department of Education.



Activity 4:**The Benefits of Trade****Goal:**

A global understanding of agricultural interdependency

Proficiency/Indicator:**Economics**

Comprehend relationships; identify patterns of trade; describe trade relationships.

Content:

Because nations have different resources they specialize in the kinds of goods and services they produce. Nations then trade to obtain the goods and services that they do not produce. When individuals or countries trade voluntarily, both parties benefit from the trade. There are no winners or losers. If this were not so, the trade would not have taken place at all.

Individuals and nations use money to facilitate trade. Using money is much more efficient than simple barter. When one receives money in a trade, one then can use the money to purchase any other item. As with money, it is not necessary that both parties want what the other has.

Directions:**A Trading Session**

1. Discuss and identify the different goods that are produced using corn, soybeans, or hogs.
2. Pass out a small amount of play dough modeling compound to each student. Tell students to produce a product that other students in the class would want. The product must be a corn, soybean, or hog product.
3. Each student must describe what he or she has produced.
4. Then give students about 5 minutes to trade what they have produced. The goal is to try to trade for the products that you want the most. The trade must be voluntary. There is no limit to the number of trades that can be made.
5. Discuss the trading activity. Did you get what you wanted most? (In most cases - no!) Why? (The other person did not want what I had produced!) How can we make trade easier? (Use money) When a trade was made, who was better off? (Both parties or the trade would not have taken place.)

6. Enlarge the discussion to include all products. The same principles hold - when trade is voluntary, both trading partners benefit. This is why trade is so important for nations.

Activity 5: Disasters Affect Supply and Demand

Goal: An understanding of the climate, natural resources, soil types determines the agricultural products of a nation.

Proficiency/Indicator:

Economics Demonstrate the relationship among factors such as price, supply, and demand.

Content: The weather plays an important role in determining the supply and demand for agricultural products. The initial influence of weather is on supply. Adverse weather conditions decrease the supply of a product. For example, the hard freeze in Florida in December 1988, severely damaged citrus and vegetable crops, reducing supply, and resulting in a price rise for these products. Supply reductions because of weather then can have an affect on the demand for products produced elsewhere. For example, the reduced supply of citrus and vegetable crops in Florida likely would result in an increase in demand for citrus and vegetables from other regions or countries. In these regions and countries there likely would be an increase in demand for agricultural transportation services. In other word, the effects of severe weather in the region are not isolated, and result in price changes throughout the world economy.



Directions:

1. Share with students the article, "El Ninos, III Winds," from the *National Geographic's* February 1984 issue. This article demonstrates how a dramatic change in the global weather cycle brought natural disasters to much of the world.

If the article is not available, facts include:

ECUADOR	Rains, floods caused 400 million dollars' worth of damage to crops and property.
AFRICA	Drought reduced crop production by 40 percent to 70 percent. Thousands of livestock died.
AUSTRALIA	Suffered severe drought and dust storms. Thousands of sheep were slaughtered because farmers could not feed and water them. Crop and property damage amounted to \$2,500,000,000.
MEXICO	Dry conditions reduced crop value by \$400,000,000.

2. Discuss the article and these questions:
 - a. How did the weather conditions illustrated affect the crops of the countries?
 - b. Where did the people in the countries get food after the disasters struck?
3. Present the situations on the situation card shown. Let students determine how weather conditions affect the supply of goods in the affected countries of their demand of farm goods from other countries. Assume that no other changes take place except for those on the situation cards. Answers are in parenthesis.

Situation 1: Droughts in Africa destroyed available grazing land for cattle. How does this affect the supply of African beef? (Decrease) How does it affect the African demand for American beef? (Increase)

Situation 2: Severe flooding in Ecuador washed away much of the rice crop soon after it was planted. How does this affect the demand for American rice? (Increase) How would it affect American rice prices? (Increase)

Situation 3: Europe's most favorable weather in recent years produced an abundant vegetable crop. How does this affect their demand for vegetables from the United States? (Decrease) How would this affect American vegetable prices? (Decrease)

Situation 4: The floods in Ecuador destroyed much of the banana crop. How does this affect the world's supply of bananas? (Decrease) What effect does this have on banana prices? (Increase)

Situation 5: How would an unexpected freeze in Spain's orange-growing region affect the demand for Florida oranges? (Increase)

Situation 6: A drought has destroyed much of France's grape vineyards. How does this affect the supply for French wine? (Decrease) What would happen to the price of French wine? (Increase) What would happen to the demand for California wine? (Increase)

Situation 7: The USSR had a relatively mild winter and a better than average wheat harvest. What is the effect on their demand for United States wheat? (Decrease) How does this affect the price of wheat in the U.S.A.? (Decrease)

Note: This lesson was adopted from the lesson, "Disasters and Demand," from *Teaching the Economics of the Food and Fiber System: 4-6 Intermediate*, published by the Arkansas State Council on Economic Education, 1986.

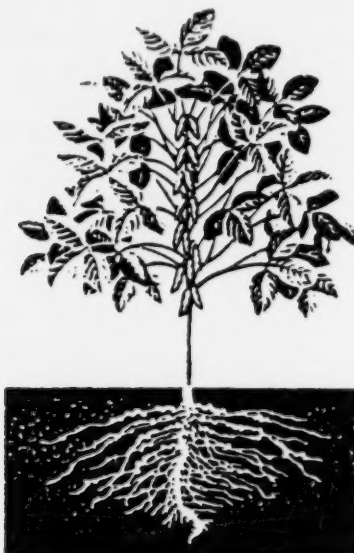
Activity 6: A Seedy Picture

Proficiency/Indicator:

Fine Arts Create with a variety of 2 or 3 dimensional media, e.g., drawing, painting, collage, sculpture, etc.

Materials: Soybeans, glue, paper, paint, and crayons.

Directions: Glue soybeans on paper to create a picture or mosaic of a product or products derived from the soybean.



Activity 7: Soy - Soy - Soy Bean

Proficiency/Indicator:

Fine Arts Create rhythmic, melodic, and harmonic material utilizing vocal, instrumental, and electronic media.
Share creative drama activities with others.

Materials: Resources on the soybean, including history facts, lay-products, uses, etc.

Directions: Using current information on the soybean, write a song or rap to educate the general public on the importance of soybeans. Perform your creation for others!

Activity 8: Soybean Science

Proficiency/Indicator:

Science Predict interaction of water, soil, and temperature on soybeans. Compare observations of the growing of soybeans in different light settings.

Materials: Paper towels, thermometer, paper cups, soybeans, grains, different types of soil.

Directions: Working in small groups or individually, students will:

1. Research and list the ultimate conditions that allow soybeans to grow the best.
2. Place 10 soybeans in a damp cloth (keep damp cloth at room temperature) and record the growth of the root each day on a bar graph for 10 days.
3. Transplant each germinated soybean into paper cups, each filled with different types of soil (clay, sand, loam) and record the growth.
4. Using results from each individual's record of growth, make a class total bar graph of the growth in each type of soil. Draw conclusions from the comparisons of growth.
5. Draw and label the parts of a soybean plant.
6. Dissect a soybean seed longitudinally. Draw and label the parts of the section.

Activity 9:

Problem Solving and Data Interpretation

Proficiency/Indicator:

Mathematics

Collect, organize, analyze, and interpret data through the use of fundamental analysis procedure and communicate appropriate conclusion.

Materials:

Calculator and graph paper.

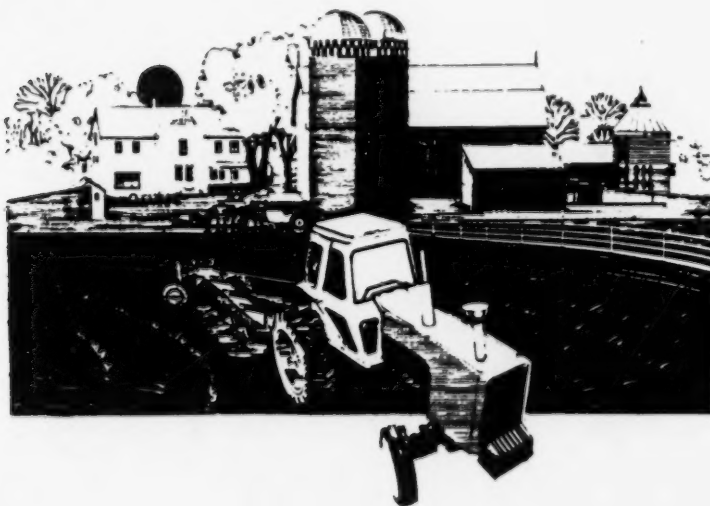
Problem #1

You estimate that your soybean field can be plowed in one week and and four days if you schedule three tractors to work 12 hours a day, 6 days a week.

- a. How many hours do all three tractors combined have to work to plow the field?
- b. You can only get two tractors at that time. How many hours a day will each tractor have to work to get the job done in two weeks working seven days a week?

Problem #2

- a. The United States supplies 80 percent of the world soybean exports. We exported 21,493,000 metric tons of soybeans to the world market in 1987-1988. How many metric tons of soybeans were exported by other soybean producer nations to meet the demand in 1987-1988?
- b. Change the amount of soybeans of other soybean producer nations into bushels. (1 metric ton = 39.4 bushels)



Activity 10: Indiana's Ambassador To The World: The Soybean

Proficiency/Indicator:

Social Studies Students should be provided with opportunities to analyze the interaction of people and institutions in economic systems.

Economic Themes: Interdependence, International Trade, Imports, Exports

- a. Students will examine the meaning of the terms import and export.
- b. Students will identify major importers of Indiana soybeans.
- c. Students will identify products exported by nations who buy Indiana soybeans.
- d. Students will generate ideas about how trade relationships affect Indiana and its trading partners.

Materials: Large globe or wall map, poster board or construction paper for charts, magic markers, individual student maps of the world showing political divisions and major physical features.

Extended Activity 1: Soybeans are one of Indiana's most important export crops. Write the words import and export on the blackboard. Ask students to supply meanings for these words until useable definitions are generated. Indiana exports the largest amount of soybeans to Japan, the Netherlands, Taiwan, Spain, Korea, and West Germany. Have students locate these nations on the map. Ask students to speculate about what products we import from these trading partners. Students can research this question by using library resources or by examining the labels of products found at home and school.

Examples of United States imports from:

Japan - automobiles, electronic equipment
Taiwan - clothing, electronic equipment
Spain - shoes, other leather products
West Germany - automobiles, watches
Netherlands - chocolate

Students can then develop a chart showing the major imports and exports for Indiana and each of the trading partners above. After charts are made, ask students to consider how each area of the world is affected by this exchange of products. Questions to engage students in answering might include the following:

What reasons would these nations have to buy Indiana soybeans? Why don't they produce soybeans themselves? What do they use soybeans for? Why is Indiana buying some of the products exported by its trading partners? What are the positive and negative results of this exchange?

Extended Activity 2: On individual world maps, have students locate and outline Indiana, the United States, Japan, the Netherlands, Taiwan, Spain, Korea, and West Germany. Give each student a slip of paper that describes the route that products being imported and exported might take. Have them identify and label rivers and bodies of water. Using different colored magic markers, have them trace land and water routes that products would take from the exporting country to their final destinations around the world.

Example: Indiana and Spain - Soybeans and Shoes

Blue marker - Soybeans from Central Indiana might go by truck to Jeffersonville, by barge down the Ohio and Mississippi rivers to New Orleans, and by ship to Barcelona, Spain.

Red marker - Shoes from Central Spain might travel by truck to Barcelona, by ship to New York, and by truck to Central Indiana.

Note: Activity 1 and 2 above might also be adapted to examine the trading relationships with nations that import Indiana CORN and HOGS.

Activity 11:

Know What You Eat! (A Learning Family Activity of parents, teachers, students, and community members.)

Soybeans, corn, or any major food product grown in your county is appropriate for this activity.

Proficiency/Indicator:

Language Arts

Use reading skills in the gathering, retaining, and analyzing of information.

Materials:

Soybean products, paper plates, and napkins.

Directions:

Children and parents compile a list of food products in their home that contain soybeans.

Teachers and students compare their individual lists and compile a master list.

Teachers, parents, community members contribute soybean products from the list for an international tasting party.

Bring soybean plants or pictures to class.

FACT SHEET

Hogs

About one-fourth of the meat eaten in the United States comes from hogs. These animals provide lean cuts of meat (loin, chops, ham, and roast) as well as prepared/deli items (sausage and bacon). The fat, skin, hair, and other parts of hogs are used to make lard, leather, brushes, soap, fertilizer, glue, medicines, and many other products.

Farmers in almost every country raise hogs. People who see hogs wallowing in mud often consider them dirty and stupid. But hogs keep themselves cleaner than do most farm animals. Hogs are also intelligent animals.

There are about 764 million hogs on farms throughout the world. China has the most hogs, about 40 percent of the world total. The Soviet Union ranks second and the United States ranks third in hog production. About one-fifth of the farms in the United States raise hogs. Hogs rank with cattle, poultry, and dairy products as one of the chief sources of farm income in the country.

Indiana is ranked number four nationally in hog production. Hoosiers eat the meat of hogs as pork chops, spareribs, loin roasts, ham, bacon, and sausage. Some hog meat, such as pigs feet and knuckles, is pickled. People also eat other parts of the hog's body such as the stomach, kidneys, liver, ears, brain, skin, snout, jowls, lips, tongue, and throat. In 1987, there were 4,300,000 hogs in Indiana.

In the past, lard was used for cooking which was made from hog fat. Today, with the development of vegetable oil, lard is very rarely used for cooking. Some people in the United States enjoy fried chitterlings, or hog intestines. Some religions, such as Islam and Judaism, forbid their followers to eat hog meat because they regard hogs as unclean.

Wild hogs roamed throughout Europe and other parts of the world as long as 6 million years ago. Scientists believe people began taming hogs during the stone age, about 8,000 years ago. Explorers and colonists from Spain, England, and other countries brought hogs to North and South America in the early 1500s.

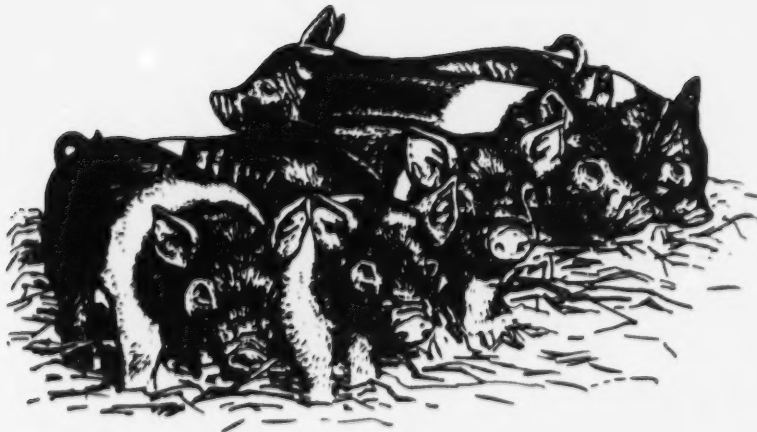
The father or male hog is called a boar, the mother female is a sow, and the baby is a piglet. Hog feed is usually cracked corn and supplement. When pigs are about six months old, they are ready for market and weigh about 200 to 220 pounds. There are a number of breeds (kinds) of hogs. The most popular breeds are Hampshire, Yorkshire, and Duroc. Two or three litters of pigs per sow are born each year on the farm. On an average a litter contains eight baby pigs.

1988 PIG CROP



Indiana comprises about 8 percent of total United States pork production. Of the total poundage of pork produced nationwide, 1.7 percent of this goes to the export market. So by taking the average, Indiana exported, on an average, 21.5 million pounds of pork or approximately 9.750 metric tons with a value of 14-15 million dollars. It is estimated that in 1989 (out of this 21.5 million pounds of pork), 56 percent went to Japan, 24 percent to Mexico, 6 percent to Caribbean, 5 percent to Canada, and 9 percent to other locations. Overall, Indiana pork exports are growing. Nationwide, pork exports in 1989 increased 38 percent with Japan showing the largest import increase at 23 percent.

Note: 1 metric ton = 1000 kilograms
1 kilogram = 2.205 pounds



Activity 1: Let's Put a Fork in the Pork

Proficiency/Indicator:

Language Arts Interact with a variety of printed materials. Speak before an audience for a variety of purposes.

Materials:

1. Several recipe books
2. Recipe cards (file cards 3 inch by five inch)
3. Ingredients

Directions:

1. Students use recipe book to find recipes that use pork as a main ingredient.
2. Each student selects his favorite and writes it on a recipe card.
3. Each student introduces his recipe orally to the class and tries to sell it as the one the class should select to cook.
4. Class votes on their favorite choice of recipes.
5. Class brings ingredients and makes their favorite recipes.

Activity 2:

Productive Resources: The Things We Need for Production

Goal:

An understanding of the resources required to produce and market agricultural products.

Proficiency/Indicator:

Economics

Analyze current resources available in nations.

Content:

It takes **productive resources** to produce goods and services. Economists classify these productive resources into three basic categories: **Natural resources, labor resources, and capital resources.** Natural resources are any resources, including land itself, found in nature. Human resources are any human work effort that goes into production. Capital resources are the tools, equipment, machines, and buildings used in production.

Directions:

Identify Productive Resources

1. Teach and discuss the concept of productive resources.
2. Students should research what productive resources are needed to produce hogs, here and in other countries.
3. Invite a hog farmer to explain hog farming to the class.
4. Discuss with the students if their perception of hog farming changed as a result of the farmer's visit.
5. On a worksheet, have students list at least four specific examples of each type of productive resources needed to produce hogs.
6. Discuss which of the productive resources are the same and which are different from those productive resources used in other countries.
7. Discuss how these resources have changed over the years.



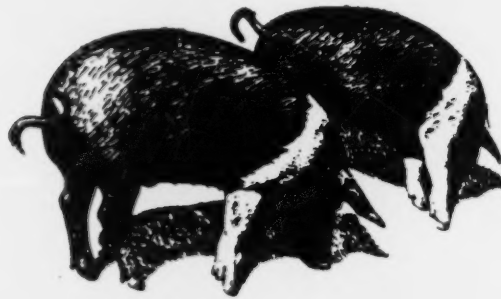
Activity 3: Hog - RA - RA - RA - Rap

Proficiency/Indicator:

Fine Arts Create rhythmic melodic, and harmonic material utilizing vocal, instrumental, and electronic media. Share creative drama activities with others.

Materials: Resources on the pork industry, including facts, products, recipes, myths, etc.

Directions: Using current information on pork, educate the general public on the value of importance of the hog. Perform your creation for others!



Activity 4:

This Little Piggie Went to Market

Proficiency/Indicator:**Fine Arts**

Share creative drama activities with others

Use creative drama to tell a story

Materials:

Pork products (food, leather, brushes, glue, etc.)

Directions:

Ask students to bring in products from home that are made from hogs. Discuss these products with the class and display in the classroom.

Brainstorm ways to develop a play that traces the origin of every day products back to the hog. Assign different responsibilities, scripts, props, publicity, etc. and begin the project.

Extended Activity:

Update the fairytale "The Three Little Pigs" and set the story in a developing country.



Activity 5: Pigs and Science

Proficiency/Indicator:

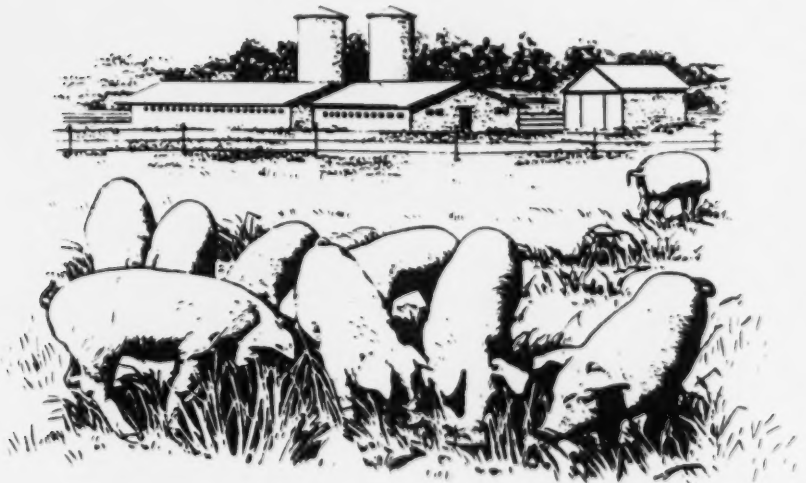
Science Investigative skills, using reliable sources of information, communicating scientific and technological education, sketchings, and analyzing systems.

Materials: Contact the Indiana Pork Producers association to locate nutritional information.

Visit a local supermarket and pig farmer to make arrangements for a field trip.

- Directions:**
1. Research the nutritional value of pork.
 - a. Calculate the amount of cholesterol in a three pound pork roast.
 - b. Locate and list the minerals and vitamins found in pork.
 2. Construct a food chain for pork.
 - a. What do farmers feed pigs to make them healthy and marketable?
 - b. Find out where most farmers get the food for their pigs.
 3. Research the processes used to prepare pork for shipment to other nations.
 - a. How is lunch meat prepared for shipment to other countries?
 - b. How are pork chops, roasts, ribs, and sausage prepared for shipment to other countries?
 - c. Find out where Indiana pork is exported and locate these nations on a map.
 4. Survey a local supermarket to determine how pork products are prepared for healthy consumption by consumers.
 - a. What pork products are prepared for purchase in the supermarket?
 - b. Locate five products that are prepared for consumers and shipped to the local supermarket. (Sausage, bacon, lunch meat, etc.)

5. Visit a modern hog farm to find out:
 - a. How hogs are fed.
 - b. How pig technology is used to feed, care for, and transport hogs.
 - c. What happens to the animal waste.
 - d. Where the baby pigs are born.
6. Interview a local farmer about the medicines and vitamins used to keep pigs healthy.
 - a. What vitamins do farmers use and how does this effect the quality of the meat?
 - b. What are the most common diseases pigs have? What medicines are used to treat their diseases?
7. Predict the effect of the untreated waste from 500 hogs on the quality of a local stream, pond, or river.
 - a. Find out what farmers do with the sewage waste from hogs.
 - b. Make at least two recommendations to manage the waste effectively.
8. Sketch a plan of a modern hog farm showing how hogs are processed for market.



Activity 6:**Problem Solving and Data Interpretation****Proficiency/Indicator:****Mathematics**

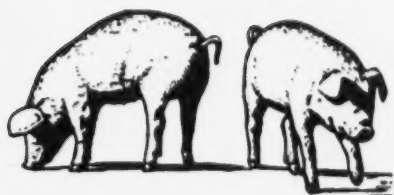
Collect, organize, analyze, and interpret data through the use of fundamental analysis procedures and communicate appropriate conclusions.

Materials:

Calculator, graph paper

Problem #1

John and Mary Ward own some land in southern Ripley County. Because of the prospect that hog prices are increasing, they are considering starting a hog farm. Consider the data in the chart below.



Price of Hogs in Ripley County

Year	Price per Hundred Weight	Year	Price per Hundred Weight
1960	\$18.50	1979	\$69.50
1965	22.75	1980	61.90
1970	26.10	1981	56.25
1975	38.40	1982	56.00
1978	56.25	1985	54.75

Question A: Interpret the data to determine if the selling price for the past few years is in fact increasing or decreasing.

Question B: Make a simple graph of the data. Make sure you label the horizontal and vertical scale of the graph as well as give it a title. Remember to allow for years on the graph for which there is no data.

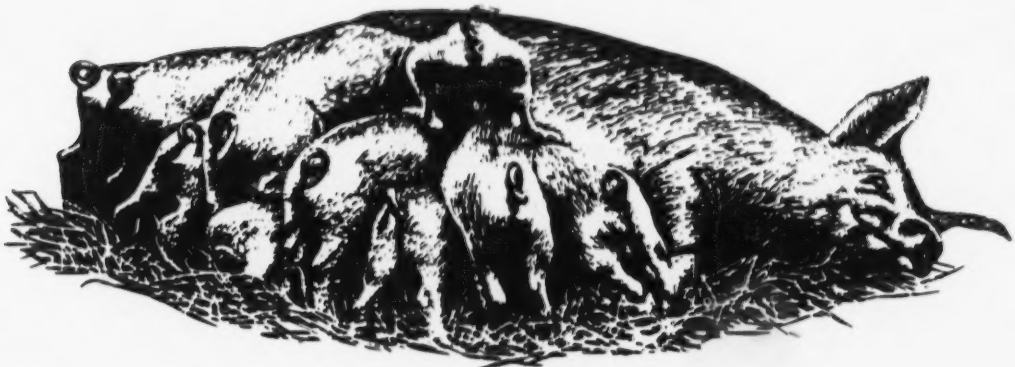
Question C: Interpret the graph to find the highest selling price. Underline the year that has the highest selling price. How have the prices changed recently?

Problem #2

A farmer needs to fence a hog pen. It has four sides measuring 935 feet, 723 feet, 605 feet, and 985 feet. The wire he uses comes in 50-foot rolls. The cost of the wire is \$200 per roll. How much will the wire for the fence cost?

HAPPY HOG ACTIVITIES

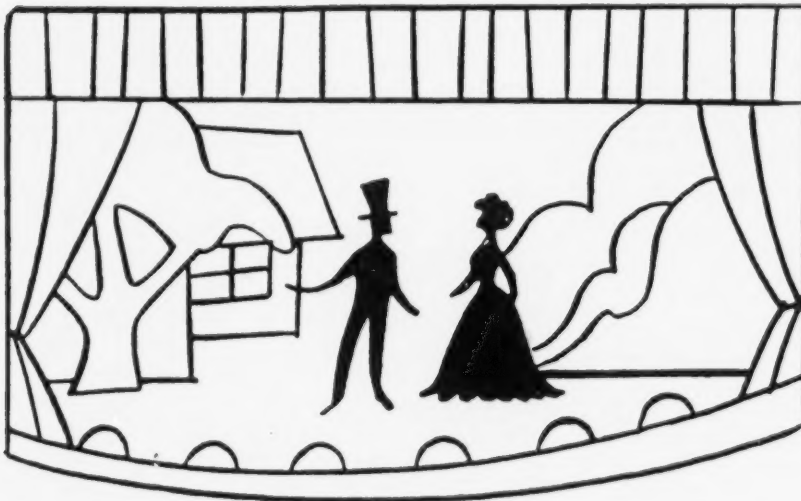
1. Illustrate a drawing of a hog on drawing paper and label the parts. Underline in red the characteristics of a hog that make it a mammal.
2. Discuss the traits the hog has in common with man. Act out these traits in a skit. Examples might be: a child playing in mud like the piglet plays in mud.
3. Jewish and Muslim dietary laws prohibit the eating of hog meat. It may be that these rules were written because of the dangers of trichinosis. Explain why ancient cultures often got trichinosis and why we don't hear much about it today.
4. Draw a picture of a pig rolling in the mud. Explain why a pig rolls in the mud.
5. Make up a cartoon about a pig.
6. Do a puppet show with "Miss Piggy."
7. Draw a picture of the animals a pig would pick for best friends. Explain why you chose the ones you did on the back of the picture.
8. Illustrate and explain the "ideal" pig pen - use your imagination! Make it wonderful!
9. Compose a song about pigs.
10. Construct a life size pig out of paper-mache.
11. "PIGS ARE BEAUTIFUL" - Mind map all of the things you think are beautiful about pigs.
12. Rewrite the "Three Little Pigs" in a modern version and illustrate it.
13. Rewrite "This Little Piggy Went to Market" and illustrate it. Share your ideas with the kindergarten class.
14. "Pig Mania" - Design a board game with a "pig" theme. (Don't get too dirty!)



Pygmalion was a sculptor and King of Cyprus in Greek legend. Pygmalion carved an ivory statue of a beautiful woman and fell in love with it. The goddess Aphrodite made the statue a living women called Galatea. Pygmalion and Galetea married.

George Bernard Shaw wrote a play Pygmalion. The play tells how an Englishman makes an elegant lady out of an ignorant girl by teaching her to act and speak correctly.

Write a short play about "change." Act out the play in front of the class.



Semantic Mapping: Semantic mapping is a strategy for developing, activating, and organizing background knowledge about a topic. Semantic maps display words, ideas, or concepts in categories and indicate how words relate to one another. Semantic maps assist students in linking their existing knowledge to a new idea.

Steps in constructing a semantic map

Step 1 A topic can be introduced in one of two ways:

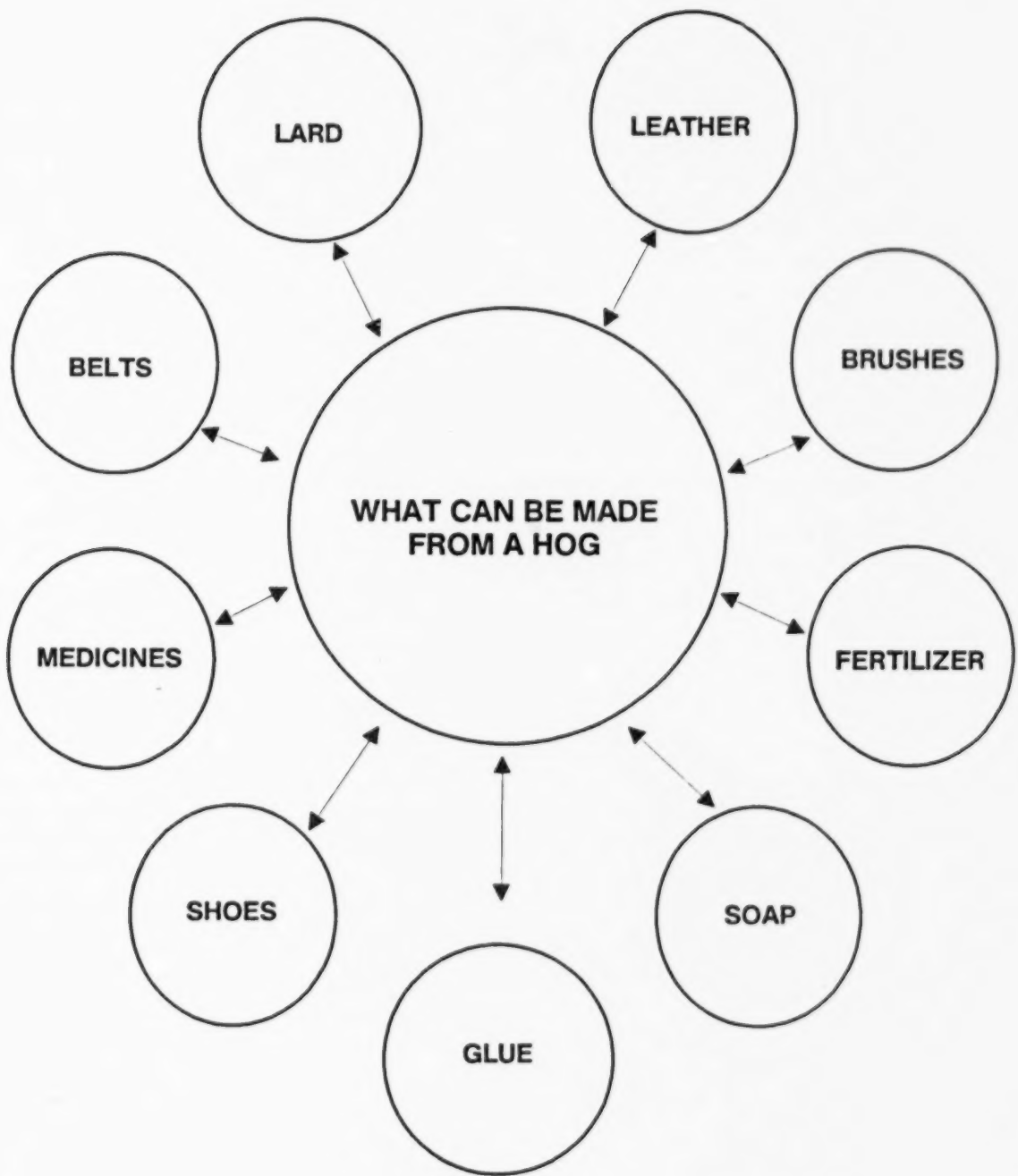
- a. Once a topic has been stated, e.g., hogs, a brainstorming session ensues, with students quickly listing what comes to mind. When a sizable group of words and phrases has been generated, students can be asked to identify categories for clustering the words.
- b. After the topic has been stated, students can be asked to identify categories and these can be written around the central word or phrase.

Step 2 When students have exhausted their knowledge about the topic, they can be asked to develop questions about gaps in the knowledge of the topic. These questions can be written down, on the board or by students individually or in pairs.

Step 3 Have students read to search for answers to their questions and also new ideas.

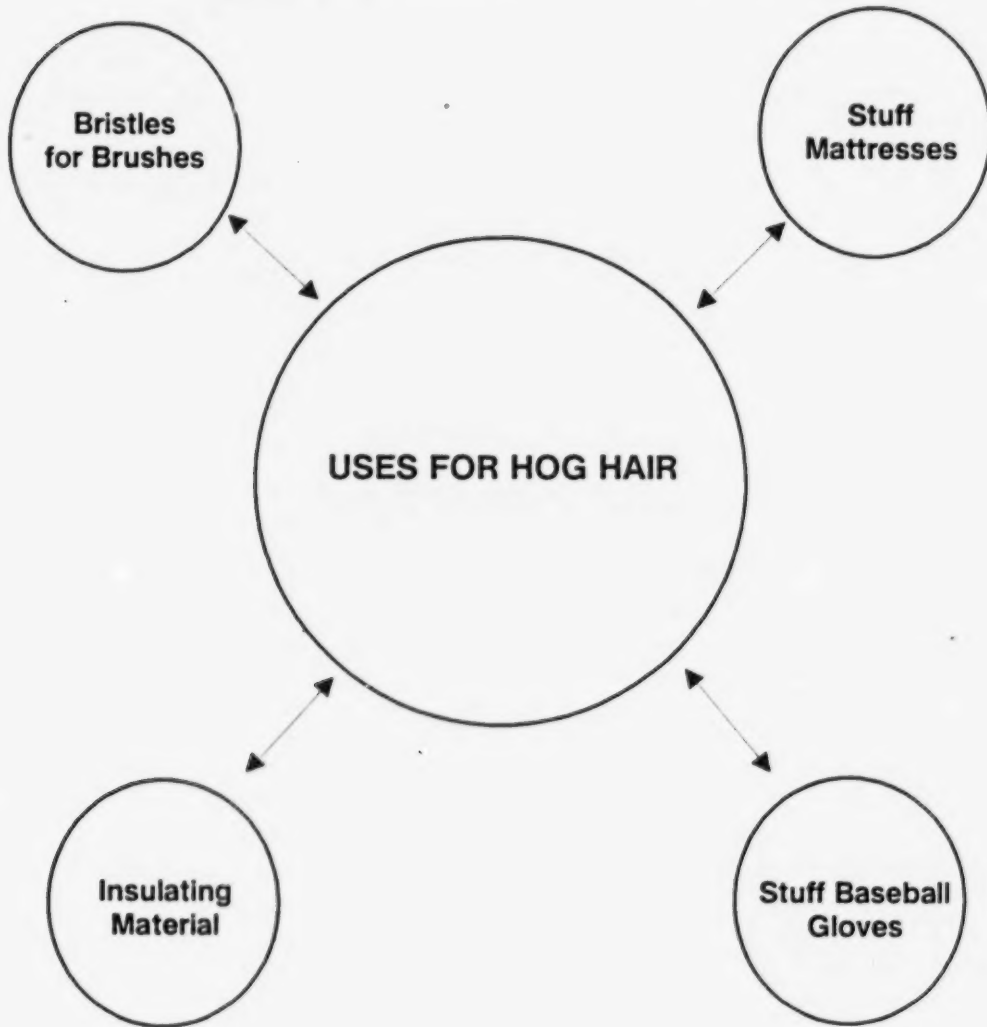
Step 4 Semantic maps should be examined from the perspective of the information that has been gained from reading. When necessary, maps should be reorganized to better illustrate relationships among items.

Note Students who have had experience with teacher-led semantic mapping should be encouraged to develop maps on their own. Maps generated by different students on the same text or topic can be compared during group discussions. Students and teachers should approach this activity from the stance that a set of ideas can be organized in a variety of ways. Semantic mapping provides an excellent alternative to note taking or outlining.



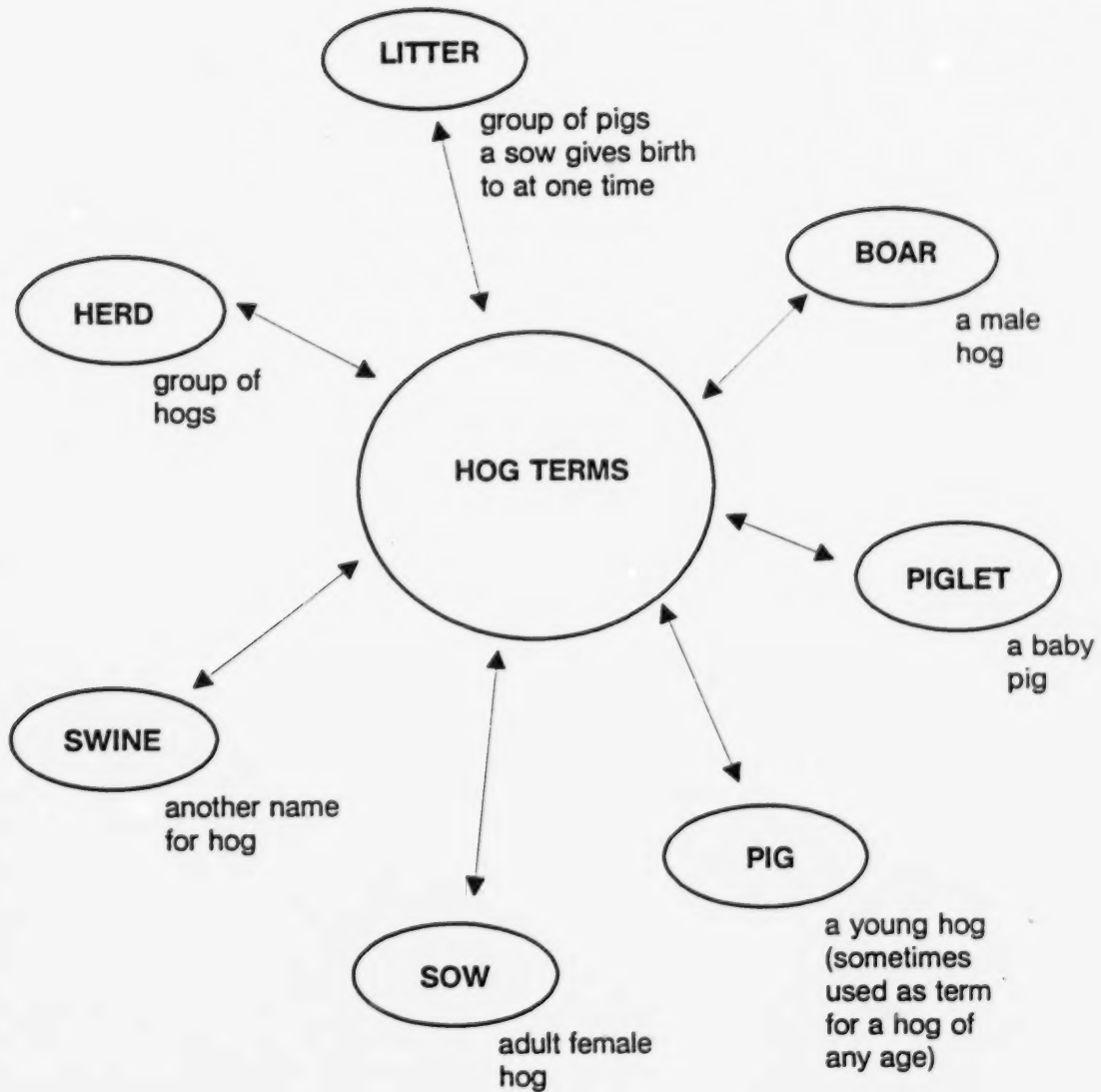
Semantic map what products come from hogs!

Research and brainstorm uses of HOG HAIR!



“THE HAIRY HOG ACTIVITY”

HOGS



Mammals that like being called HOG!

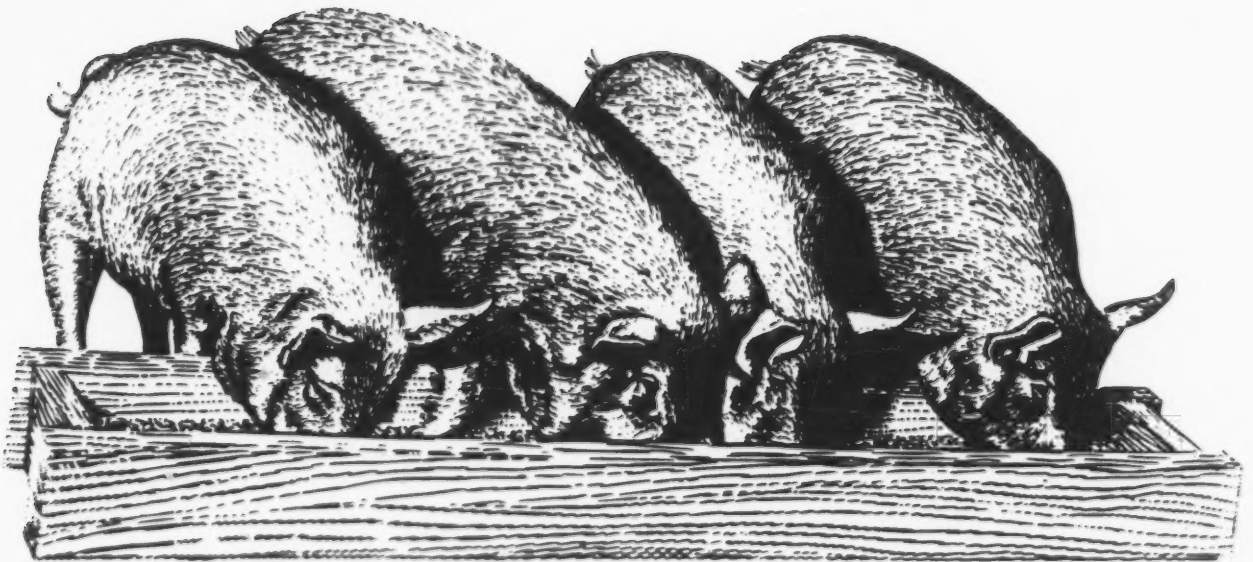
Mindmap in groups all of the PIG WORDS you can think of today!



Each group will take one word to teach to the class.

PROVERBS FOR DISCUSSION

1. "The Old Sow"
2. "You can't make a silk purse out of a pig's ear." What does this mean.
3. "Fat as a pig"
4. "Dirty as a pig"



Activity 7:

Our favorite hog "Wilbur" from *Charlotte's Web*.

Proficiency/Indicator:

Language Arts

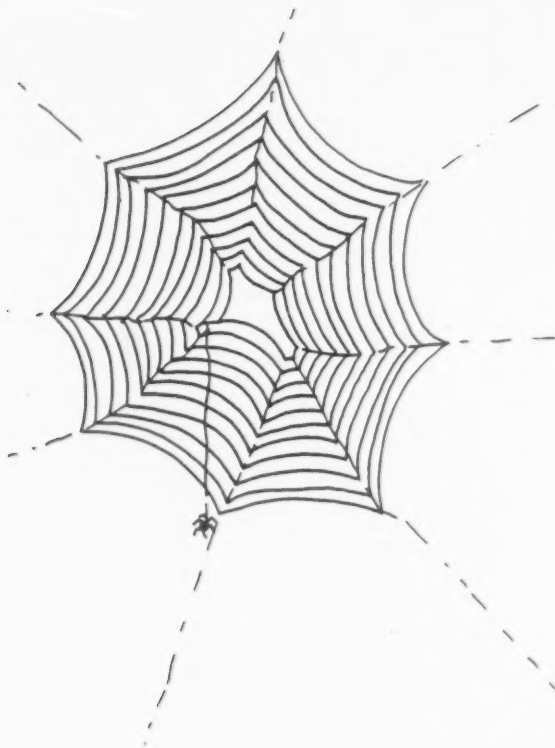
Participate and enjoy imaginative situations, e.g., creative dramatics.

Materials:

1. Attached sheet "Children's Theater"
2. Five cardboard (5" x 8") with names (Wilbur, Goose, Narrator, Sheep, and Charlotte) written on each. String attached so students can hang around their neck.

Directions:

1. Divide students into groups of five.
2. Assign role to each student.
3. Students practice in groups.
4. Read/present to class.



Charlotte

Chapter V

- Wilbur: That crazy rat! Why does he have to stay up all night grinding his claspers and destroying people's property? Why can't he go to sleep like any other decent animal? What time is it?
- Goose: Probably-obably-obably about half-past-eleven. Why aren't you asleep Wilbur?
- Wilbur: Too many things on my mind.
- Goose: Well, that's not my trouble. I have nothing on my mind, but I've got too many things under my behind. Have you ever tried to sleep while sitting on eight eggs?
- Wilbur: No. I suppose it is uncomfortable. How long does it take a goose egg to hatch?
- Goose: Approximately-oximately thirty days, I'm told. But I cheat a little. On warm afternoons, I just put a little straw over the eggs and go out for a walk.
- Narrator: Wilbur and the goose doze off.
- Wilbur: Oh beautiful day, it is here at last! Today I shall find my friend. Attention, please! Will the party who addressed me at bedtime last night kindly make himself or herself known by giving an appropriate sign or signal!
- Attention please! I will repeat the message. Will the party who addressed me at bedtime last night kindly speak up. Please tell me where you are, if you are my friend!
- Sheep: Stop your nonsense, Wilbur! If you have a new friend here, you are probably disturbing his sleep. The quickest way to spoil a friendship is to wake somebody up in the morning before he is ready. How can you be sure your friend is an early riser?
- Wilbur: I beg everyone's pardon. I didn't mean to be objectionable.
- Charlotte: Salutations!
- Wilbur: Salu-what?

Charlotte: Salutations!

Wilbur: What are they, and where are you? Please, please, tell me where you are. And what are salutations?

Charlotte: Salutations are greetings. When I say 'salutations,' it's just my fancy way of saying hello or good morning. Actually, it's a silly expression, and I'm surprised that I used it at all. As for my whereabouts, that's easy. Look up here in the corner of the doorway! Here I am. Look, I'm waving! See me now?

Wilbur: Oh, yes indeed, yes indeed! How are you? Good morning! Salutations! Very pleased to meet you. What is your name, please? May I have your name?

Charlotte: My name is Charlotte.

Wilbur: Charlotte what?

Charlotte: Charlotte A. Cavatica, but just call me Charlotte.

Wilbur: I think you're beautiful.

Charlotte: Well, I am pretty. There's no denying that. Almost all spiders are rather nice-looking. I'm not as flashy as some, but I'll do. I wish I could see you, Wilbur, as clearly as you can see me.

Wilbur: Why can't you? I'm right here.

Charlotte: Yes, but I'm near-sighted. I've always been dreadfully near-sighted. It's good in some ways, not so good in others. Watch me wrap up this fly. First, I dive at him. Next, I wrap him up. There! Now I knock him out, so he'll be more comfortable. He can't feel a thing now. He'll make a perfect breakfast.

Wilbur: You mean you eat flies?

Charlotte: Certainly. Flies, bugs, grasshoppers, choice beetles, moths, butterflies, tasty cockroaches, gnats, midges, daddy longlegs, centipedes, mosquitoes, crickets - anything that is careless enough to get caught in my web. I have to live, don't I?

Wilbur: Why, yes, of course. Do they taste good?

Charlotte: Delicious. Of course, I don't really eat them. I drink their blood. I love blood.

Wilbur: Don't say that! Please don't say things like that!

Charlotte: Why not? It's true, and I have to say what is true. I am not entirely happy about my diet of flies and bugs, but it's the way I'm made. A spider has to pick up a living somehow or another, and I happen to be a trapper. I just naturally build a web and trap flies and other insects. My mother was a trapper and my grandmother before her. All our family have been trappers. Way back for thousands and thousands of years we spiders have been laying for flies and bugs.

Wilbur: It's a miserable inheritance.

Charlotte: Yes, it is. But I can't help it. I don't know how the first spider in the early days of the world happened to think up this fancy idea of spinning a web, but she did, and it was clever of her, too. And since then, all of us have had to work the same trick. It's not a bad pitch, on the whole.

Wilbur: It's cruel.

Charlotte: Well, you can't talk. You have your meals brought to you in a pail. Nobody feeds me. I have to get my own living. I live by my wits. I have to be sharp and clever, lest I go hungry. I have to think things out, catch what I can, take what comes. And it just so happens, my friend, that what come are flies, insects, and bugs. And furthermore, do you realize that if I didn't catch them, bugs would increase and multiply and get so numerous that they'd destroy the earth and wipe out everything.

Wilbur: Really? I wouldn't want that to happen. Perhaps your web is a good thing afterall.

Goose: There are a lot of things Wilbur doesn't know about life. He's really a very innocent little pig. He doesn't even know what's going to happen to him around Christmas time; he has no idea that Mr. Zuckerman and Lurvy are plotting to kill him.

Activity 8: Mobile Mania

Proficiency/Indicator:

Language Arts Use ready skills in the gathering, retaining, and analyzing of information.

Materials: Construction paper/tag board, markers, stencils, scissors, maps, yarn, resource books, newspapers, magazines

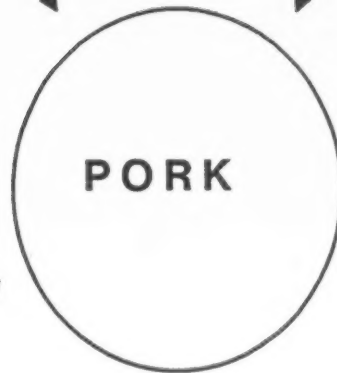
- Directions:**
1. Ask students to develop their own semantic map about pork.
 2. Explore a variety of materials to gather more information about the topic.
 3. Compare and contrast students' semantic maps during a group discussion.
 4. Design a creative mobile to illustrate the facts on their semantic maps.
 5. Hang the mobiles to decorate the room using a special theme.

Importers

Japan
Mexico
Caribbean
Canada

Farms

China
Soviet Union
United States



PORK

Food

Ham
Tenderloin
Pork Chops
Pork Roast
Ground Pork
Bacon
Sausage

**Nonfood
Products**

Leather
Brushes
Soap
Fertilizer
Glue
Medicine

THE CHALLENGE: Expanding Your Agricultural Education Program

This **International Agricultural Education** module has concentrated on three Indiana agricultural products - corn, soybeans, and hogs. These products, fact sheets, and activities serve as a model for you to use to expand your agricultural education program.

You are encouraged to design additional activities which focus on other important agricultural products such as: beef, turkey, chicken, apples, popcorn, tomatoes, lumber, watermelons, dairy products, winter wheat, and sheep. Your new activities should feature the major crops in your county and community.

Look around your community for exciting places to visit and study. Farms, orchards, businesses, supermarkets, factories, grain storage sites, agricultural transportation centers (trucking centers), ports, airports and railroads, and gardens. Have agricultural resource people visit your classroom to help educate your students about the importance of agriculture to their community and Indiana. Help students to trace the routes of the products as they are shipped from your community to many parts of the world.

The Indiana Department of Education and Indiana Agricultural Awareness Council invites you to share your new activities, programs, and resources. Send them to:

Office of School Assistance
International Agricultural Education
Indiana Department of Education
Room 229, State House
Indianapolis, Indiana 46204
(317) 232-9141

Please send two or three student action photographs with your new program.

AGRICULTURAL EDUCATION RESOURCES

To assist local agricultural education efforts, a variety of free or inexpensive materials and services are available to classroom teachers. The organizations listed below can assist and support your program:

1. **County Soil and Water Conservation District** - Each district has conservation information available for the county, and some employ education specialists to assist.
2. **County Cooperative Extension Service Office** - The county youth agent can assist you in obtaining 4-H and other related university publications.
3. **Indiana Department of Education** - This agency can provide science lessons for your outdoor classrooms. For copies of these lessons contact:

Outdoor Classrooms
Office of School Assistance
Indiana Department of Education
Room 229, State House
Indianapolis, Indiana 46204
(317) 232-9141

4. **Indiana Department of Natural Resources** - Nationally recognized interdisciplinary curriculum guides emphasizing forestry and wildlife for Grades K-12 are offered free to workshop participants. For more information contact:

Project Learning Tree or Project Wild
6013 Lakeside Boulevard
Indianapolis, Indiana 46278
(317) 290-3223

5. **Soil Conservation Service** - For an expanding source list of environmental education materials available from other organizations contact:

Information Officer
Soil Conservation Service
6013 Lakeside Boulevard
Indianapolis, Indiana 46278
(317) 290-3222

6. **Indiana Farm Bureau, Inc.** - For "Ag in the Classroom" and Fourth Grade Agricultural Supplement contact:

Indiana Farm Bureau, Inc.
130 East Washington Street
P.O. Box 1290
Indianapolis, Indiana 46206
(317) 263-7830

7. **Indiana Wildlife Federation** - For National Wildlife Week Kits and other NWF materials contact:
Indiana Wildlife Federation
P.O. Box 283, Zionsville Drive
Zionsville, Indiana 46077
(317) 873-3915
8. **National Association of Conservation Districts** - For "Conserving Soil" (single copy - \$8.50 plus \$1.35 postage and handling) contact:
National Association of Conservation Districts
Service Department
P.O. Box 855
League City, Texas 77573
9. **Indiana Institute of Agriculture, Food, and Nutrition** - For 4th grade Agricultural Curriculum Supplement used in conjunction with Indiana History (cost \$20) contact:
Indiana Institute of Agriculture
Food and Nutrition
101 West Washington Street
Suite 1320 East
Indianapolis, Indiana 46204
10. **Governor's Council on Rural Development** - For Minnesota's Ag-Stravaganza curriculum materials (K-6) \$15.00 plus \$2.00 shipping and handling (make checks payable to Minnesota Association of SWCDs) contact:
Laura Noy
Governor's Council on Rural Development
869 East Fifth Street
St. Paul, Minnesota 55106
(612) 774-0500
11. **Hoosier National Forest, Public Affairs Specialist** - For Smokey the Bear, Woodsey the Owl, and other teaching materials contact:
Hoosier National Forest
Public Affairs Specialist
811 Constitution Avenue
Bedford, Indiana 47421
(812) 275-5987
12. **Soil and Water Conservation Society** - For Farm and Food Bytes computer software (\$29 plus shipping and handling) contact:
Soil and Water Conservation Society
7515 Northwest Ankeny Road
Ankeny, Iowa 50021-9764

13. *K-6 Geography: Themes, Key Ideas, and Learning Opportunities.*

Contact:

National Council for Geographic Education
16A Leonard Hall
Indiana University of Pennsylvania
Indiana, Pennsylvania 15705

14. *Geography in Grades 7-12: Themes, Key and Learning Opportunities.*

Contact:

National Council for Geographic Education
16A Leonard Hall
Indiana University of Pennsylvania
Indiana, Pennsylvania 15705

15. *Maps. The Landscape and Fundamental Themes in Geography.*

Contact

National Geographic Educational Services
17th and M Streets
Washington, D.C. 20036

16. *Teaching Economics in the Mini-Economy.*

Contact:

Indiana Department of Education
Center for School Improvement and Performance
Office of School Assistance
Room 229, State House
Indianapolis, In 46204-2798.

17. *Trading Around the World: Introducing Economics into the Middle School/Junior High School Curriculum.* (work in progress)

Contact:

Indiana Department of Education
Center for School Improvement and Performance
Room 229, State House
Indianapolis, IN 46204-2798.

18. *Acid Rain.* (Issues Series). John McCormick. Gloucester, Fairmont, WV 1986. Up-to-date coverage of this high-interest topic in concise format. Grade 5 and above.

19. *All About Seeds.* Susan Kuchalla. Troll Associates, Mahwah, NJ 1982. 29 pages with illustrations. In this useful introduction to the higher plants, seed source and dispersal and some aspects of plant growth are well covered, as are seed generation and seedling development. The illustrations are captivating without being sentimental. This is one of the few good botany books for very young readers.

20. *Aquaculture: Farming in Water*. Louis Wolfe. Putnam, New York, NY 1972. 107 pages with illustrations. Examines the various ways man will be able to cultivate underwater plants and animals for food.
21. *A Closer Look at Plant Life*. Bernard Stonehouse. Watts, New York, NY 1978. 32 pages with illustrations. Successfully interweaves basic ideas about plant biology with the evolutionary story of the plant kingdom. Covers plant diversity, photosynthesis, role in the food chain, early plants in aquatic environments, and conquest of the land by plants. Flower structure and diversity are related to sexual reproduction, pollination, and seed dispersal. Dicots, monocots, annuals, biennials, storage organs, and woody plant structures are all covered.
22. *Dining on a Sunbeam: Food Chains and Food Webs*. Phyllis S. Busch. Four Winds, Bristol, FL 1973. 60 pages with illustrations. Busch has written an excellent book on food chains and food webs. After reading this book and looking at the many excellent black-and-white photographs, the child should understand the important interrelationships of producers, primary and secondary consumers, and decomposers. Photosynthesis is discussed carefully and several examples of food chains are described in detail.
23. *A First Look at Flowers*. Millicent E. Selsam, and Joyce Hunt. Walker, New York, NY 1977. 32 pages with illustrations. Short, succinct sentences set forth a series of classification problems and puzzles with needed definition worked unobtrusively into the descriptions. The sharp, accurate line drawings of flowers and their parts distinguish one flower from another. A useful base for hands-on activities.
24. *From Flower to Fruit*. Anne O. Dowden. Crowell, New York, NY 1984. Describes how, for various plants, fertilization occurs, how seeds are produced, and how flowers mature into fruits. Excellent color drawings. Scientific terms clearly defined.
25. *From Food to Fertilizer: The Role of Excrement in the Life Cycle*. Charles Clay Dahlberg. Young Scott, New York, NY 1973. 70 pages with illustrations. The digestive and urinary system in man, useful bacteria which aid decomposition of matter, different forms of animal droppings, and varied uses of manure are illustrated with well chosen examples. A thought-provoking chapter on attitudes toward excrement completes a book which might serve as an early introduction to ecology.
26. *The Future World of Agriculture*. Wendy Murphy. Grolier, New York, NY 1984. 112 pages with illustrations. Series: Walt Disney World EPCOT Center Book Based on the Land Exhibit at Walt Disney EPCOT Center. Traces the history of agriculture with emphasis on future methods of farming and growing food.

27. *Gardening Without Soil*. Sarah R. Riedman and Rod Slater. F. Watts, New York, NY 1979. 64 pages with illustrations. An introduction to hydroponics, what it is, how it is done, why it is useful, and its potential for future use, with directions for setting up your own project.
28. *Green Treasures: Adventures in the Discovery of Edible Plants*. Charles Morrow Wilson. Macrea Smith, Philadelphia, PA 1974. 184 pages. Introduces agriculture pioneers through the ages, who discovered and cultivated many edible plants, and discusses the increasing disappearance of many valuable plants through careless and uninformed use.
29. *How Plants Are Pollinated*. Joan Elma Rahn. Atheneum, New York, NY 1975. 135 pages with illustrations. Plant pollination is covered in detail, with emphasis on mechanisms and means of pollination (such as by wind, animals, bees, butterflies, birds, bats, and water). Several topics are covered in great detail, emphasizing the physical interaction of the pollinating agent and the pollinating organ of the plant. The illustrations are outstanding. Highly recommended.
30. *How Seeds Travel*. Cynthis Overbeck. Lerner, Minneapolis, MN 1982. 48 pages with illustrations. Examples from both familiar and exotic plants show the dissemination of seeds by wind, water, and animals. There is a brief review of reproduction in flowering plants, and many illustrations (not all of which are clearly labeled). Clearly written, the text provides a thorough and attractive account of a subject often given only cursory coverage in texts for these grades.
31. *Inside an Egg*. Sylvia A. Johnson. Lerner, New York, NY 1982. 48 pages with illustrations. This lavishly illustrated book describes the major changes of the chick embryo through its first 21 days of development. An excellent introduction to vertebrate development in general, with clear, well-labeled drawings and high-quality color photographs. A useful reference, although somewhat technical for many fifth and sixth graders.
32. *Lots of Rot*. Vicki Cobb. Lippincott, Philadelphia, PA 1981. 35 pages illustrated by B. Schatell. Easy-to-do experiments on mold, bacteria, and mildew. Explanations of how rot plays an important role in the cycle of living things. Illustrated in color. Good ideas for science projects.
33. *Man's Useful Plants*. Michael A. Weiner. Macmillan, New York, NY 1976. 146 pages with illustrations. This simply written and amply illustrated book discusses foods and beverages, as well as medicines, fabrics, wood products, and other materials made from plants. A small but select reading list will direct students to more detailed explanations.
34. *Oak and Company*. Richard Mabey. Greenwillow, New York, NY 1983. 28 pages with illustrations. Lavish full-color paintings and readable text tell the story of an English oak tree from acorn to death 282 years later.

35. *Once There Was a Tree*. Natalia Romanova. Dial, New York, NY 1985. Pictures by Gennady Spirin. When a tree dies, the stump becomes a source of life for many creatures until a new tree grows in its place. Beautifully illustrated brief text.
36. *Plant Experiments*. Verak Webster. (A New True Book) Children's Press, Chicago, IL 1982. 47 pages with illustrations. Five activities and six experiments for young readers, including culture and examination of mold and examination of root growth and leaf growth. Activities include plant identification with clear diagrams, excellent color photos, and simplified text.
37. *Plants on the Go: A Book About Seed Dispersal*. Eleanor B. Heady. Parents', New York, NY 1975. 64 pages with illustrations. The author interests readers in the subject of seed dispersal by briefly describing the structure and function of plants, then telling about the flowers from which seeds come. Various types of seeds are described, illustrated, and classified according to mode of travel. Attractively arranged with appealing illustrations, the book also includes instructions for a few experiments.
38. *Roots Are Food Finders*. Franklyn M. Branley. Crowell, New York, NY 1975. 33 pages with illustrations. Suitable for students with good reading skills, this book teaches some of the functions of plant roots. Without using technical terminology, the author explains the external structure of roots, compares different types, and relates them to ecological principles. Encourages the reader to experiment by including instructions for a "lab" exercise that can be performed at home.
39. *Science Experiences: Ecology*. Jeanee Bendlick. Watts, New York, NY 1975. 71 pages with illustrations. Introduces elementary scientific terminology and provides step-by-step introduction to ecology. Covers how energy passes from the sun to plants to animals; production of oxygen for animal life; food supply and simple and complex food chains; cycles, extinction, adaptation, competition, the web of life, dependence on water, oxygen, and carbon dioxide, and the effects of pollution.
40. *Science in Your Own Back Yard*. Elizabeth K. Cooper. Harcourt, New York, NY 1970. 192 pages. Nature activities which can be done even on a small lot, involving soil and rocks, grass, water, plants, worms and insects, birds, clouds and weather, stars, and outer space!
41. *The Seed the Squirrel Dropped*. Haris Petie. Prentice-Hall, Englewood Cliffs, NJ 1976. 28 pages with illustrations. Traces the life history of a cherry tree and presents the various stages of growth quite clear in very simple words. The story ends with the recipe for the cherry tart that the boy in the story bakes.

42. *Understanding Hydroponics: Growing Plants without Soil.* George Sullivan. F. Warne, New York, NY 1976. 96 pages with illustrations. Defines hydroponics, discusses its history and uses, and includes suggestions for hydroponics at home.
43. *Walk in the Forest.* Ilka Katherine List and Albert List. Crowell, New York, NY 1977. 197 pages with illustrations. Beautifully illustrated with photographs and drawings, this informative guide discusses many aspects of forest plant and animal life, including the concept of the food chain and the process by which leaves change color in the fall. There is also a bibliography and many projects which can be done in the forest.
44. *Famine in Africa.* Floyd Timberlake. Gloucester, Fairmont, WV 1986. Concise, informative, attractive, accessible to Grades 5 and above. History and causes of famine in Africa.
45. *Farming Around the World.* Louise L. Floethe and Richard Floethe. Scribner, New York, NY 1970. 40 pages with illustrations. Describes the major farming activities of countries around the world, such as harvesting pineapples in Hawaii, herding sheep in Australia, and picking coffee berries in Brazil.
46. *The Food Crisis.* Harold E. Schlichting, Mary Southworth Schlichting, and Don Collins. Steck-Vaughn Co., Austin, TX 1973. 48 pages with illustrations. Series: Wings Series. Summarizes the history of agriculture, and discusses the problems of food production for a growing population and some of the new foods which may be available in the future.
47. *The Hungry World.* Elaine Israel. Messner, New York, NY 1977. 64 pages with illustrations. A successful attempt to explain some of the reasons for world hunger in both developing and developed countries. Geological and political reasons for famine and food distribution are discussed, with accompanying photographs on almost every page. Sensitive explanations and difficulties with Green Revolution technology are handled well.
48. *Stubborn Land.* Norman Webster. EMC Corporation 1973. 46 pages with illustrations. Current agricultural practices and problems in China are presented in a slim volume with color photographs. The need for a more plentiful food supply and for good land and water supplies is among topics discussed.
49. *World Food.* Edith Raskin. McGraw-Hill, New York, NY 1971. 160 pages with illustrations. Discusses the ways man has improved his food supply by improving crop yield and livestock quality, as well as utilizing diverse food sources.

SPECIAL NOTES:

1. Always check with your local soil and water conservation district (SWCD) for educational materials and programs from that office.
2. Involve your local farmers, Farm Bureau, and agricultural businesses in your program.